

## AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been broken down into sections.

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SECTION: 1 OF 2

DOCUMENT #:

TITLE: Draft Dangerous and/or Mixed  
Waste RD&D Permit;  
Demonstration Bulk Vitrification  
System



0062224

STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

3100 Port of Benton Blvd • Richland, WA 99352 • (509) 372-7950

July 21, 2004

Mr. Roy J. Schepens, Manager  
Office of River Protection  
United States Department of Energy  
P.O. Box 450, MSIN: H6-60  
Richland, WA 99354

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Mr. Keith Klein, Manager  
Richland Operations Office  
United States Department of Energy  
P.O. Box 550, MSIN: A7-50  
Richland, WA 99354

Mr. Ed Aromi  
CH2M HILL Hanford Group, Inc.  
P.O. Box 1500, MSIN: H6-63  
Richland, WA 99334

Dear Messrs. Schepens, Klein, and Aromi:

Re: Draft Dangerous and/or Mixed Waste Research, Development, and Demonstration Permit (RD&D); Demonstration Bulk Vitrification System (DBVS Facility)

This letter transmits the proposed draft RD&D Permit for the DBVS Facility **which is not for** incorporation into the *Dangerous Waste Portion of the Hanford Facility Resource Conversation and Recovery Act (RCRA) Permit for the Treatment, Storage, and Disposal (TSD) of Dangerous Waste* (Permit), WA7890008967; however, the RD&D Permit is assigned the same U.S. Environmental Protection Agency (EPA) identification number. Additional copies of the draft RD&D Permit will be provided on CD-ROM if requested.


Public review of the draft RD&D Permit is required for forty-five (45) days, in accordance with Washington Administrative Code (WAC) 173-303-809(2). The public review begins on July 26, 2004, and ends September 9, 2004. A public hearing is scheduled for the Washington State Department of Ecology (Ecology) Office in Richland on August 31, 2004. Ecology has distributed copies of the draft RD&D Permit to the Hanford Public Information Repositories in Richland, Spokane, Seattle, and Portland for public review.

Messrs. Schepens, Klein, and Aromi  
July 21, 2004  
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The draft RD&D Permit package consists of the Fact Sheet, Permit Conditions, Compliance Schedules, Attachments AA through LL, *Washington State Environmental Policy Act* (SEPA) Environmental Checklist, and Mitigated Determination of Non-Significance (DNS).

If there are any questions about this letter, please contact Ms. Kathy Conaway at (509) 372-7890.

Sincerely,

  
Michael A. Wilson  
Program Manager  
Nuclear Waste Program

cc w/o attachment: Joel Hebdon, USDOE  
Billie Mauss, USDOE-ORP  
Dennis Hamilton, CHG  
Felix Miera, CHG  
Richard Raymond, CHG  
Stuart Harris, CTUIR  
Pat Sobotta, NPT  
Russell Jim, YN  
Todd Martin, HAB  
Ken Niles, ODOE  
Administrative Record: RD&D Dangerous Waste Permit  
Environmental Portal

**FACT SHEET**  
**FOR**  
**DANGEROUS AND/OR MIXED WASTE RESEARCH, DEVELOPMENT,  
AND DEMONSTRATION PERMIT**  
**DEMONSTRATION BULK VITRIFICATION SYSTEM**  
**LOCATED IN THE**  
**200 WEST AREA OF THE HANFORD SITE**  
**RICHLAND, WASHINGTON 99354**

**WA7 89000 8967**

**Permittees**

U.S. Department of Energy, Office of River Protection  
Owner/Operator  
P.O. Box 450  
Richland, Washington 99354

CH2M HILL Hanford Group, Inc.  
Co-Operator  
P.O. Box 1500  
Richland, Washington 99354

This fact sheet has been developed by the Washington State Department of Ecology (Ecology) in accordance with the requirements of Washington Administrative Code (WAC) 173-303-840(2)(f). Its purpose is to discuss the proposed draft research, development, and demonstration (RD&D) permit for the U.S. Department of Energy (USDOE), Office of River Protection (ORP) for the proposed Demonstration Bulk Vitrification System (DBVS) Facility located west of and adjacent to the 241-S Tank Farm in the 200 West area of the Hanford Site.

This fact sheet provides the following information:

- Section A – RD&D Permit Overview
- Section B – Description of the Bulk Vitrification Test and Demonstration Facility
- Section C – General requirements and administration for an RD&D permit in Washington
- Section D – Procedures for reaching a final decision on the DBVS Facility RD&D draft permit
- Section E – Summary of the approach and permit requirements in the draft RD&D permit for the DBVS Facility
- Section F – Time limits under this draft RD&D permit
- Section G – Conclusion

## **A. OVERVIEW**

The purpose of the RD&D permit is to allow for the Test and Demonstration of the bulk vitrification facility for treatment of Hanford Site tank wastes. The permit is temporary in duration and limits the quantities of dangerous and/or mixed waste to be treated. (Mixed waste is defined as a dangerous, extremely hazardous, or acutely hazardous waste that contains both radioactive and hazardous constituents). The Permit also includes stringent terms to protect public health and the environment.

The treatment process which would be developed under this permit is a key element of the overall treatment system being developed to retrieve and remediate the mixed waste in the underground storage tanks at Hanford's tank farms. The safety and cleanup of these tanks has been a major public concern for some time.

Under this permit, the Permittees will evaluate the ability of bulk vitrification to produce immobilized low-activity waste (ILAW) that is comparable to that proposed for the Hanford Site Waste Treatment and Immobilization Plant (WTP) immobilized low-activity waste form. The Permittees will be required to provide data for waste form qualifications, risk assessments, and performance assessments for treatment and near-surface land disposal of low-activity waste.

Mixed waste retrieved as salt-solution from single-shell Tank 241-S-109 will be processed through the bulk vitrification treatment system which consists of mixing the waste with glass-forming agents (soil and small amounts of minerals) and drying, transferring the contents into a container lined with heat-resistant insulation materials, and heating the contents by resistive heating through electrodes immersed in the soil/waste mixture. The heat produced by the resistance of the waste/soil mixture will create temperatures high enough to melt the glass formers and incorporate the low-activity waste. The resistive heating melts the waste and glass forming agents into a monolithic vitrified (glass) mass. Gases generated during the process are captured within the enclosed vitrification container and, along with cooling air, are routed to an offgas treatment system. Some of the containers will be "spiked" with various simulants and other additives to represent the wide variety of tank waste that is contained in the Hanford Tank Farms.

Containers of vitrified wastes from RD&D activities are expected to be disposed of on-site in a Resource Conservation and Recovery Act (RCRA) permitted disposal facility. Prior to final disposal, containers of vitrified wastes will be stored within the DBVS Facility, or other on-site permitted container storage areas, such as the Central Waste Complex. The vitrified waste form in the container will be sampled and analyzed in accordance with the Ecology approved DBVS Facility campaign plan. Some secondary wastes will be generated from the process. The secondary wastes will be analyzed, treated, and properly disposed of on-site at a permitted facility.

Exhaust gases (purge air, water vapor, waste decomposition products, etc.) from vitrification are vented to an offgas treatment system. The offgas treatment system will be designed, maintained, and operated to minimize the emissions of air contaminants and to minimize process upsets.

This RD&D project is a key step to the design of a full scale bulk vitrification facility if bulk vitrification is chosen as the best option for supplementing the low-activity waste vitrification at the WTP. This RD&D project is identified as milestone M-45-00 and M-62-00 in the *Hanford Federal Facilities Agreement and Consent Order* (HFFACO).

## **B. FACILITY DESCRIPTION**

Ecology received a Dangerous Waste Permit Application for the RD&D on May 10, 2004, USDOE, ORP and CH2M HILL Hanford Group Inc. (CH2M HILL). The proposed DBVS Facility is owned by ORP and will be managed and co-operated by CH2M HILL. ORP will have the responsibility for all administrative, operational, regulatory compliance, and other responsibilities associated with activities under the proposed RD&D permit. All activities will be conducted at the Hanford Site, Richland, Washington. The U.S. Environmental Protection Agency (EPA) identification number is WA7 890008 967, which covers the entire Hanford Site. The RD&D draft permit is not part of the (Hanford Sitewide RCRA Permit) Dangerous Waste Portion of the RCRA Permit for the Treatment, Storage, and Disposal (TSD) of Dangerous Waste Permit issued to USDOE March 28, 2000, which has the same EPA identification number.

A *Washington State Environmental Policy Act* (SEPA) environmental checklist was submitted in support of the application for an RD&D permit May 10, 2004. Ecology reviewed the draft permit and the SEPA environmental checklist and prepared a Mitigated Determination of Non-Significance (DNS). A Categorical Exclusion (CX) was prepared by ORP for the DBVS Facility in accordance with the National Environmental Policy Act (NEPA) and USDOE implementing regulations, 40 Code of Federal Regulations (CFR) 1500-1508 and 10 CFR 1021. General information concerning the Hanford Facility environment can be found in the *Hanford Site National Environmental Policy Act (NEPA) Characterization* report (PNNL-6415).

In addition to the RD&D permit, ORP will apply for and obtain the following permits prior to the start-up of DBVS Facility operations:

- Emissions Source Construction Permit (Washington State Department of Ecology, Nuclear Waste Program). If nonradioactive emissions are below permitting thresholds found in WAC 173-400-102, an exemption from permitting requirements will be requested.
- Radioactive Emissions Source Construction Permit (Washington State Department of Health).
- Radioactive Air Emissions Notice of Construction Application for a Categorical Tank Farm Facility Waste Retrieval and Closure: Phase II – Waste Retrieval Operations (Washington State Department of Health).

- Criteria and Toxics Air Emissions, Categorical Notice of Construction Application for Operations of Waste Retrieval Systems in Single-Shell Tank Farms (Washington State Department of Ecology).

The DBVS Facility will test in-container bulk vitrification of Hanford Site dangerous and/or mixed wastes from Tank 241-S-109. The permit application proposes treatment of up to 1,135,500 liters, or about 300,000 gallons, of Tank 241-S-109 waste in two phases, or approximately one-half the waste contained in Tank 241-S-109. The 1,135,500 liters (300,000 gallons) is less than 1% of the 53 million gallons of tank waste stored in the Hanford double-shell tanks and single-shell tanks.

The ORP has created aggressive initiatives to accelerate the closure of the Hanford Site tank farms with single-shell tanks (SSTs) and double-shell tanks (DSTs) containing mixed radioactive and dangerous waste. To meet the *Hanford Federal Facilities Agreement and Consent Order* (HFFACO) requirements for completing retrieval of all SSTs by 2018 and completing tank waste treatment by 2028 (M-45-00 and M-62-00), and effectively managing costs, ORP is evaluating bulk vitrification treatment of waste from selected tanks to supplement high-level waste and low-activity waste (LAW) vitrification at the WTP.

Completing low-activity waste treatment by 2028 without adding a second LAW WTP facility would require making optimal use of the first WTP melter to maximize throughput during the design life of the plant. It will also require providing additional treatment approaches outside the WTP for low-activity waste streams such as bulk vitrification.

The proposed DBVS facility will be used to evaluate the ability to produce ILAW that is comparable to that proposed for the WTP ILAW; the compatibility of the technology with actual tank waste; the safety, efficiency, and potential cost-effectiveness of the bulk vitrification process; and the feasibility of full-scale application. The proposed DBVS Facility is designed to investigate requirements for feed material handling, equipment operation, residual material handling, production and control of secondary wastes, and potential environmental impacts associated with the process.

### **C. RCRA PERMITTING OF RD&D FACILITIES IN WASHINGTON**

The Washington State Hazardous Waste Management Act, Chapter 70.105 Revised Code of Washington (RCW) and the regulations promulgated there under in Chapter 173-303 of the WAC, regulate the management of dangerous waste in Washington. Ecology may issue an RD&D permit to a facility that proposes to utilize an innovative and experimental dangerous waste treatment technology or process as specified in WAC 173-303-809. The following significant provisions of the regulations apply to permitting RD&D facilities:

- Ecology has the responsibility to ensure that an RD&D permit includes terms and conditions on the design and operation of the facility to assure protection of human health and the environment. [WAC 173-303-809(1)]
- RD&D permits will provide for the receipt and treatment by the facility of only those types and quantities of dangerous waste that is necessary for purposes of determining the efficacy and performance capabilities of the technology or process and its effects on human health and the environment. [WAC-173-303-809(1)(a)]
- RD&D permits will include such requirements that are necessary to protect human health and the environment (including, but not limited to, requirements regarding monitoring, operation, financial responsibility, closure, and remedial action), and such requirements that are necessary for the purposes of testing and providing information on the operation of the facility. [WAC 173-303-809(1)(b)]
- Ecology has some discretion when determining which permitting requirements of a dangerous waste treatment facility should be applied to an RD&D facility. However, the primary mandate to protect human health and the environment must be assured. [WAC 173-303-809(2)]
- Ecology has the authority to immediately terminate all operations at an RD&D facility at any time it determines that termination is necessary to protect human health and the environment. [WAC 173-303-809(3)]
- Operation of an RD&D facility is limited to one year (based on 365 separate "operating days" which may be non-consecutive) unless renewed. An issued RD&D permit issued may be renewed not more than three times. Each such renewal will be for a period of not more than one year. [WAC 173-303-809(1) and (4)]

The draft permit indicates Ecology's tentative decision to issue an RD&D permit for the DBVS Facility. This tentative decision is subject to public review and comment. Ecology will consider all public comments before making its final decision on whether to issue an RD&D permit to the DBVS Facility. (Regulatory requirements for the public review process are in WAC 173-303-840(3) through (9), and discussed in Section D of this Fact Sheet.)

Ecology will sign the RD&D permit, if a final permit is issued to the facility. Ecology has primary responsibility for ensuring compliance with dangerous and/or mixed waste regulations, including making permitting decisions.

#### **D. PROCEDURES FOR RECEIVING PUBLIC COMMENT AND REACHING A FINAL PERMIT DECISION**

A 45-day public comment period on Ecology's tentative decision to issue an RD&D permit to the DBVS Facility runs from July 26, 2004, to September 9, 2004. All comments received during the public comment period will be considered and responded to before final decisions are made on the proposed conditions. Comments must be post-marked or received by e-mail no later than September 9, 2004. Comments hand

delivered by September 9, 2004, to the address below also will be accepted. Direct all written comments to:

Kathy Conaway  
Department of Ecology  
3100 Port of Benton Boulevard  
Richland, Washington 99354  
E-mail address: [kcon461@ecy.wa.gov](mailto:kcon461@ecy.wa.gov)

A public meeting will be held on August 31, 2004, at the address shown above. Verbal comments can be made at the meeting. Ecology will consider and respond to all written comments submitted by the deadline and verbal comments submitted at the public meeting. After considering the comments and testimony, Ecology will either finalize their decision or make a new tentative decision. If Ecology finalizes the decision, it will become effective 30 days after Ecology provides notice of the decision to the Permittees and all who commented. However, if no public comments are received on the tentative decision, then the final decision will be effective as soon as Ecology announces it. If Ecology's decision includes substantial permit changes because of public comment, Ecology will initiate a new public comment period.

All commenters and the Permittees shall receive a copy of the responsiveness summary and a notification of the final decision. Ecology's final decision may be appealed within 30 days after the final decision has been received.

Copies of the Permit and Fact Sheet for the Hanford Facility are available for review at the Hanford Public Information Repositories listed below. [For additional information, call the Hanford Cleanup Hotline toll-free at (800) 321-2008].

#### **HANFORD PUBLIC INFORMATION REPOSITORIES**

##### **Portland**

Portland State University  
Branford Price Miller Library  
934 SW Harrison and Park  
Portland, Oregon 97207  
(503) 725-3690  
Attn: Michael Bowman/Jocelyn Kramer  
E-mail: [bowman@lib.pdx.edu](mailto:bowman@lib.pdx.edu)

##### **Richland**

Public Reading Room  
2770 University Drive  
Consolidated Information Center, Room 101L  
Richland, Washington 99352  
(509) 372-7443  
Attn: Terri Traub  
E-mail: [reading\\_room@pnl.gov](mailto:reading_room@pnl.gov)

### **Spokane**

Gonzaga University  
Foley Center  
East 502 Boone  
Spokane, Washington 99258-0001  
(509) 323-3839  
Attn: Connie Scarppelli  
E-mail: carter@its.gonzaga.edu

### **Seattle**

University of Washington Suzzallo Library  
Government Publication Division  
Seattle, Washington 98195  
(206) 543-4664  
Attn: Eleanor Chase  
E-mail: [echase@u.washington.edu](mailto:echase@u.washington.edu)  
Public Service: (206) 543-1937

This fact sheet and draft permit are also available on the World Wide Web at  
<http://www.ecy.wa.gov/programs/nwp/>.

If special accommodations are needed for public comment, please contact Tim Hill,  
Washington State Department of Ecology, Nuclear Waste Program, at (509) 372-7908  
(voice) or (360) 407-6006 (TDD).

In addition, Ecology's SEPA decision of a determination of non-significance (DNS) is  
available for review and comment during this 45-day public comment period and at the  
public meeting. Direct all written SEPA comments to:

Melinda Brown  
Washington State Department of Ecology  
3100 Port of Benton Boulevard  
Richland, Washington 99354  
E-mail address: [Mbro461@ecy.wa.gov](mailto:Mbro461@ecy.wa.gov)

## **E. PERMITTING APPROACH AND REQUIREMENTS**

The draft permit combines two approaches to ensure protection of human health and the  
environment as required by WAC 173-303-809. These are briefly described in the  
following paragraphs.

First, although the permit is for an RD&D facility, it includes requirements that would  
apply to a commercial dangerous and/or mixed waste treatment and storage facility, such  
as procedures and standards of waste analysis, waste management, waste storage, tank  
systems, land disposal restrictions, and facility closure. Additionally, the permit  
requirements for personnel training, general facility inspection, preparedness and  
prevention, emergency planning, record keeping, and reporting, are comparable to  
requirements for a commercial treatment and storage facility. These requirements are  
discussed more fully below.

Second, design, operation, and monitoring requirements and treatment effectiveness (e.g.,  
destruction and removal of constituents in the tank waste, constituent levels in glass  
product and offgas systems emissions) are set forth in the permit to apply to each RD&D

campaign plan. For example, the Permittee is required to document in each RD&D campaign plan that the design and operation during the campaign is projected to meet performance standards (e.g., destruction and removal of organics, metal emissions, particulate emissions, etc.). The Permittee is also required during Phase II of the RD&D to perform emission testing to demonstrate performance standards. The Permit also requires that based on the organics projected to be introduced into DBVS, that no more than 50% of the organic design capacity of the carbon filter which is part of the offgas system will be utilized. The Permit requires that the remaining organic capacity of the carbon filter be tracked through a running count of the organic inventory fed, as well as, by emission monitoring. The Permit requires that emergency condition parameters and operating limits be established to warn of potential for fire, explosion, loss of sufficient vacuum in the DBVS offgas systems to recover emissions from the areas, systems or units, loss of DBVS sub-system vessel integrity, and off-normal operating conditions that could lead to potential for release from the RD&D DBVS Facility and that the DBVS Facility be operated within these limits.

### **Equipment and Process Description**

The primary technology to be used for the Demonstration Bulk Vitrification System is an in-container vitrification process where waste and glass formers such as soil and minerals are mixed, dried, and then placed in a container for vitrification. The waste material consists of a liquid salt solution retrieved from Tank 241-S-109, which will be transferred to one or more storage tanks. The waste is mixed with glass formers in a mixer/dryer unit and dried prior to being transferred to the waste vitrification container.

Demonstration Bulk Vitrification System operations will emit both nonradioactive (regulated by Ecology) and radioactive (regulated by the Washington State Department of Health) emissions and be operated in compliance with required air permit conditions. Exhaust stacks for these sources will be equipped with continuous emissions monitoring systems (CEMS) that will monitor and record emissions of radionuclides, particulate matter, carbon monoxide (CO), oxides of sulfur (SO<sub>x</sub>), oxides of nitrogen (NO<sub>x</sub>), and organics. Offgas treatment will be performed for the following Demonstration Bulk Vitrification System effluents:

- Particulate and gaseous emissions from waste receipt and storage
- Particulate emissions from process additive receipt, storage, and transfer (not including fugitive emissions from stockpiles)
- Particulate and gaseous emissions from the mixer/dryer (dedicated partial system)
- Particulate and gaseous emissions from waste container filling and vitrification
- Particulate emissions from waste container top-off after vitrification

With the exception of nonhazardous and nonradioactive process additive management emissions, which will be controlled by dedicated baghouse and vent systems, all system emissions will be routed to a main offgas treatment system prior to discharge to the atmosphere. Condensed liquids are drained into the condenser exhaust duct. Two quench/scrubber/mist eliminator systems will be installed in parallel, with one in service and the other on standby. Scrubber system offgases will pass through an additional

condenser and mist eliminator, with drainage from those units routed to the scrubber recycle tanks. An offgas heater, parallel high efficiency particulate air (HEPA) filters, and a carbon filter and a polishing filter will follow the mist eliminator. Oxides of nitrogen treatment will be accomplished by a selective catalytic reduction unit. A packed tower scrubber will be used as a backup to the selective catalytic reduction (SCR) unit. This will also allow for the option of routing exhaust gases either through the SCR or the tower scrubber. Offgases will be discharged through redundant exhaust blowers in parallel, and the system stack.

The typical waste container for the vitrification process is expected to be a steel box approximately 3.0 m high (10 feet), 2.4 m wide (8 feet), and 7.3 m long (24 feet). The waste container is lined with sand and a heat insulating liner. A lid with the electrodes attached is bolted into place. Once the waste container is prepared, power cables are connected to the electrodes and the offgas system ductwork is connected to the lid. At this time, the waste/glass forming mixture is placed in the container through a contained transfer system. The initial waste/glass forming mixture will be placed into the waste container to a depth of about 1.55 m (about 5.1 feet). Electric power will be applied to the electrodes, vitrifying the container contents via resistive heating that produces immobilized low-activity waste. Exhaust gases (purge air, water vapor, waste decomposition products, etc.) from vitrification are vented to an offgas treatment system. As the mixture initially placed in the container melts, additional mixture is added until the container is filled to the appropriate level with melted immobilized low-activity waste. Electrical resistance heating for approximately 130 hours vitrifies the waste mixture in the container. During this time, temperatures in the container may range up to 1300 degrees centigrade.

After vitrification has been completed, the container will remain connected to the offgas treatment system while cooling occurs. When the container is cool enough, additional clean soil will be added around the electrodes and to cover the top of the vitrified mass, thereby minimizing empty headspace in the container and to meet disposal site criteria. Sampling of the vitrified waste, radiation surveying, and external decontamination, as necessary, will be performed. Sampling of the melt will be conducted by a coring process through a port in the container.

### **System Operation in a Phased Approach**

Under the planned project, The Demonstration Bulk Vitrification System will be conducted in two phases with a short period between phases for equipment and site upgrades. Phase 1 operations will utilize only minimal amounts of actual waste and will be conducted over a month to three-month time frame. At the completion of Phase 1 operations, the DBVS and Waste Receipt System (WRS) will be reconfigured for Phase 2 operations. Phase 1 and Phase 2 will include all required controls and safeguards for human health and the environment and will be in compliance with all applicable state regulations.

Phase 1 will consist of treatment of up to three container loads of waste (three campaign runs) approximately up to 300 gallons and no more than 1,080 gallons of tank waste from Tank 241-S-109 (not including liquid added for retrieval). Simulants (i.e., materials

similar in chemical composition to tank waste) will be added to the waste load along with the glass formers to create a container load of treated waste. The amount of waste introduced into each container will vary during Phase 1.

Phase 2 will consist of treatment of up to 300,000 gallons (1,135,500 L) of waste in the DBVS Facility from Tank 241-S-109 (not including liquid added for retrieval). The amount of waste introduced into each container will vary during Phase 2. No more than 50 containers will be vitrified for both phases for the duration of the RD&D project.

Tank waste that does not meet the waste acceptance criteria for the DBVS Facility will be transferred to the DST system. Tank waste, process additives, and process control parameters will be varied to establish acceptable operating process and parameters and envelopes. It is anticipated that one container load of material will be vitrified weekly over 400 operating days which is expected to extend to no more than one calendar year. The goal of Phase 2 is to optimize the DBVS performance and operation for full-scale use; land disposal restriction (LDR); *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063); and the waste acceptance criteria of the receiving TSD facility.

The sodium oxide concentration in each container load will vary from approximately 2% to 20%, or the maximum concentration that produces an acceptable waste form. Container loads will be processed over a range of process additive types and fractions, waste feeds, and a range of parameter settings in the various campaigns. A campaign is defined as the receipt, processing, and vitrification of waste into a single container.

Phase 1 and Phase 2 will require a written plan for each campaign developed by the Permittees to include the information required in the RD&D permit that is submitted to Ecology for review and approval. This information will include, but is not limited to the following:

- Description of feed material and additives
- Baseline process parameters
- Range of parameter adjustments
- Operating procedures
- Management of treated waste
- Documentation that the design and operation during the campaign is projected to meet performance standards
- Updates to equipment design and configuration

#### **Treated Waste Characteristics**

The treated waste, including those that contain simulants, will be characterized to determine compliance with land disposal requirements. The data obtained from the DBVS Facility will also be used for waste form qualification, risk assessment, and performance assessment.

Process knowledge, process history, pertinent literature on waste chemistry and tank history, and analysis on the waste retrieved during Phase 1 and Phase 2 will be used to

address the Dangerous Waste Codes D001 (Ignitability) and D003 (Reactivity) before transfer to the DBVS Facility to ensure that the characteristics associated with these codes do not exist in the waste feed. The Dangerous Waste Codes D001 and D003 are not allowed in the DBVS Facility as specified in the RD&D permit. Prior to the initial receipt of dangerous and/or mixed waste in the DBVS facility, documentation, not based solely on process knowledge, showing the removal of the codes D001 and D003 is to be submitted to Ecology for approval strictly for this RD&D Permit.

### **Secondary Waste Streams**

A variety of secondary waste streams will be generated during the DBVS Facility operations. All secondary waste streams, (i.e., any output stream other than the treated DBVS Facility waste), will be managed in accordance with the *Hanford Site Liquid Waste Acceptance Criteria* (HNF-3172) or *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063) for the treatment and/or disposal path for each stream.

Secondary liquid waste streams will be stored at the DBVS Facility in RCRA approved tanks, prior to being disposed at the 200 Area Effluent Treatment Facility (ETF).

Solid and semisolid waste streams that are dangerous and/or mixed waste include, but are not limited to, waste material residues in receipt and holding tanks, collected air pollution control equipment dusts/sludges, discarded protective equipment, and discarded samples taken during campaign testing. These materials will be properly designated and packaged per HNF-EP-0063 and managed at the appropriate TSD unit in accordance with the unit's waste acceptance criteria.

Nonradioactive, nonhazardous waste streams include air pollution control equipment dusts/sludges from process additive transfer and empty process additive containers. These waste materials will be managed as general solid waste per *Hanford Environmental Protection Requirements* (HNF-RD-15332).

### **Pretreatment of Tank Waste Outside of this RD&D Permit**

The Bulk Vitrification Demonstration Project will evaluate the ability to produce satisfactory product in the form of immobilized low-activity waste that meets on-site waste disposal acceptance criteria. The technical basis for the DBVS Facility product being low-activity waste is identical to the basis for the Waste Treatment Plant Nuclear Regulatory Commission letter from C.J. Paperiello to J. Kinzer, RL, "Classification of Hanford Low-Activity Tank Waste Fraction," dated June 9, 1997. (This subject is also discussed in more detail in the letters: CH2M HILL letter from E. S. Aromi to R. J. Schepens, DOE-ORP, "The Application of the Waste Incidental to Reprocessing to Bulk Vitrification," CH2M-0301927, dated June 2, 2003; and, Memorandum from R. Schepens to P. F. Dunigan Jr., "Request Approval of Categorical Exclusion (CX) for the Treatability and Demonstration Testing of Supplemental Technologies on the Hanford Site," dated December 13, 2003. Copies of these letters will be found in the RD&D administrative record.

In brief, the 1997 Agreement between the Nuclear Regulatory Commission and USDOE set forth the waste management program to be used with respect to Hanford Site tank

waste. USDOE produced a Technical Basis Report (*Technical Basis for Classification of Low-Activity Waste Fraction from Hanford Site Tanks for the Tank Waste Remediation System*, WHC-SD-WM-TI-0699, Rev. 2), which demonstrated compliance with the three criteria in the 1997 Agreement. The three criteria are:

1. "Wastes have been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical." Specifics on how this criterion is satisfied will be elaborated on in the subsequent section.
2. "Wastes will be incorporated in a solid physical form at a concentration that does not exceed the applicable limits for Class C (Low-Level Waste) as set out in 10 CFR Part 61." The DBVS will establish that the Bulk Vitrification form does not exceed the Class C concentrations for low-level waste and will be in compliance with this criterion.
3. "Wastes are to be managed, pursuant to the *Atomic Energy Act of 1954*, so that safety requirements comparable to the performance objectives set out in 10 CFR 61, Subpart C, are satisfied." The DBVS project will establish waste form performance tests for the vitrified product to document that it will perform comparable to ILAW for long-term disposal.

As described below, the waste that will be used from Tank 241-S-109 has been and will be pretreated to remove as much radioactivity as is practicable for this RD&D project.

The pretreatment of Tank 241-S-109 consists of the following:

- Supernatant from a series of SSTs was removed and processed through cesium ion exchange at B Plant. The sludge that contains the majority of the strontium and transuranic wastes remained in the sludge left in the tanks.
- The supernatant was then processed through the 242-S Evaporator to reduce the volume prior to transfer to Tank 241-S-109.
- Storage in Tank 241-S-109 resulted in the crystallization of the saltcake with the cesium remaining in the liquid fraction. This liquid fraction containing the cesium was mostly removed by saltwell pumping that was completed in June 2001.
- Selective dissolution will be used (on a test basis) to further pretreat the wastes, which will further reduce the cesium concentration, along with other chemicals. Selective dissolution is the chemical separation of soluble chemical species (including Cs-137) on the basis of their solubility. The average C-137 concentration in the salt cake is .021 C./l.
- Simple solids/liquid separation will be performed as the waste is removed from Tank 241-S-109. This will act to separate any strontium and transuranic elements which exist primarily as particulates, from the feed to the DBVS Facility

For the DBVS project, the waste will be managed as approved in the Technical Basis Report referred to previously and in accordance with the Nuclear Regulatory Commission (NRC) criteria. The only waste that will be processed will meet the requirement of having been processed to the extent deemed technically and economically practical in the Technical Basis report and will not exceed the previous agreement for Cs-137. The waste selected for bulk vitrification will contain less than 0.05 curies (Ci) of Cs-137 per liter at a sodium concentration of 7 Molar. For the DBVS Facility, the need for simple/liquid separation is reduced because only salt cake waste will be processed. However, additional solids removal will be required for the RD&D project to assist in the removal of the insoluble Sr-90 and transuranic (TRU) constituents, thereby ensuring comparability between the WTP pretreatment process and the DBVS Facility and ensuring compliance with the NRC letter.

Waste that contains too high a level of cesium will be diverted to the SY Tank Farm. The waste that will be transferred after pretreatment into the RD&D permitted DBVS Facility will be used to demonstrate that the bulk vitrification process will meet the definition of low activity waste.

### **Container Storage**

Under this permit, the DBVS Facility is authorized to store dangerous and/or mixed waste ICV®-Packages in the approved container storage areas listed in the permit. The storage of this waste must occur in areas designed to keep containers from contact with standing liquid and keep incompatible wastes separated. Regulatory requirements for container storage in the RD&D permit include, but are not limited to, maintaining containers in good condition, only storing compatible wastes in the same container, labeling requirements, etc.

### **Tank Systems**

Under this permit, the DBVS Facility is authorized to store dangerous and/or mixed waste in approved tank systems listed in the permit. The total volume of waste is limited to quantities specified for the individual units listed in the permit. Regulatory requirements for tank systems in the RD&D permit include, but are not limited to, secondary containment, integrity assessment, engineering certifications, design and operating requirements, etc.

### **DBVS**

Under this permit, the Permittee is authorized to treat dangerous and/or mixed waste in DBVS subsystems (e.g., Incontainer Vitrification System (ICV®), Dryer, Offgas System, etc.) listed in the permit. The total volume of Tank 241-S-109 waste is limited as specified in the Permit for Phases 1 and 2. Regulatory requirements in the RD&D Permit for these subsystems include, but are not limited to, secondary containment, integrity assessments, engineering certifications, design, operating and monitoring requirements, etc.

### **Land Disposal Restrictions**

Regulatory and permit requirements for Land Disposal Restrictions in the RD&D permit include, but are not limited to, waste sampling, analysis, and quality assurance and quality control to document meeting required treatment limits.

### **Training**

ORP is required to conduct a comprehensive training program for its employees at the DBVS Facility. Training includes the following topics: health and safety, facility operations, regulatory requirements, including requirements of this permit, and emergency procedures. Additional specific training will be conducted when it is needed to prepare personnel for certain jobs at the facility. A training program will be conducted prior to the start of each campaign and during the campaign, as required. Permit Condition II.E.3.b. requires that the DBVS Facility operators be provided with specialized training, appropriately consistent with the American Society of Mechanical Engineers training for incineration systems.

### **Inspections**

The DBVS Facility is required to conduct periodic inspections at the facility on an ongoing basis. These inspections are meant to detect and prevent malfunctions, deterioration, operator error, or discharges from the facility that could cause harm to human health or the environment. Inspections would include, but are not limited to facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit.

The following are examples of some of the routine inspections that are required:

- Daily inspections of accessible areas subject to spills, including the above ground portions of tank systems, monitoring data from any leak detection equipment, and externally accessible portions of the tanks systems including secondary containment.
- Weekly inspections of accessible container storage areas to confirm that containers are segregated by material compatibility, containers are not leaking or deteriorating, adequate aisle space is maintained and that the security controls are in place.
- Additional inspections will include, but not be limited to, safety equipment and emergency response supplies, spill control equipment and supplies.

### **Emergency Planning**

The permit includes a written contingency plan that the DBVS Facility will follow in the case of an emergency. This plan coordinates with the Hanford Emergency Management Plan that covers the entire Hanford Site. The plan includes general response procedures for emergencies, and requirements to notify public officials if an emergency occurs. The plan also includes a current list of names, addresses, and phone numbers of all persons qualified to act as the emergency coordinator.

### **Recordkeeping**

The DBVS Facility must maintain detailed operating records at the facility. These records document compliance with conditions of the permit and the dangerous waste regulation. Records must also be made of spills, releases, incidents of noncompliance, and emergency situations. The records must be kept at the facility for a time period ranging from 3 years to the time the facility closes, depending on the type of record.

### **Reporting**

The DBVS Facility must report certain information to Ecology. For example, reports are required for the following: any incidence of noncompliance with this permit; nonconformance reports, Independent Qualified Registered Professional Engineer (IQRPE) reports, campaign plan reports, incidents which cause the DBVS Facility to implement their contingency plan; annual reports on the facility's operation; and annual cost estimates for closure that are adjusted for inflation. The above list of reporting requirements does not include all reports the DBVS Facility must submit to Ecology.

### **Modification Process**

The RD&D draft permit specifically requires that the three tiered modification process outlined in WAC 173-303-830(4) be followed for permit modifications required by Permit Condition II.F.6. for revising the Contingency Plan, after its implementation, and Permit Condition II.H.3. for updating the Closure Plan prior to conducting the actual closure of the RD&D DBVS Facility. Numerous anticipated updates, revisions and/or changes (e.g., DBVS campaign specific plans, substitution of equivalent or superior equipment or procedures, equipment design and configuration updates, etc.) have been specified as not requiring the permit modification process. Instead the RD&D draft permit will require that the Permittee submit this updated, revised and/or changed information for Ecology review and approval prior to its incorporation into the issued permit. This process of incorporating this required information into the RD&D draft permit, though different from the three tiered permit modification process, provides the necessary flexibility needed under the expedited review and issuance process of an RD&D permit for efficient completion of the proposed 50 campaign plans and maintains the continuing regulatory review for assuring protection of human health and the environment.

### **Closure**

The DBVS Facility must close its facility when it ceases operating as a permitted RD&D facility. Prior to closure, all of the dangerous waste must be removed from the facility. All equipment, structures, and any contaminated environmental media that may have resulted from facility operations (e.g., soil) must be either decontaminated (to pre-operational levels) or removed. If this cannot be accomplished, then ORP must conduct remedial action and/or post-closure care to ensure any contamination remaining on site would not cause additional contamination to the environment. Ecology expects that closure performance standards will be met through removal or decontamination, and that neither remedial action nor post-closure care will be required. However, if additional

cleanup of the facility is needed, it can be required through an administrative order, a modification of this permit, or issuance of another permit.

The permit includes the requirements for cost estimate for facility closure and cost estimate for post-closure monitoring and maintenance in accordance with the regulations.

#### **F. TIME LIMITS IN THE DBVS FACILITY DRAFT PERMIT**

Time limits in the draft permit are complex, and they warrant a detailed discussion in this fact sheet. There are two different time limits in the permit. The permit will expire when either of the two limits is first reached.

The first limit is 400 operating days for the RD&D treatment activities. The second limit is an expiration date of three years from the issue date of the permit. The permit may not be reissued.

A 365 operating day limit for a RD&D permit is based on a regulatory limit [see WAC 173-303-809(1) and (4)] and specific federal guidance (see EPA Office of Solid Waste and Emergency Response (OSWER) "*Guidance Manual for Research, Development, and Demonstration Permits under 40 CFR Section 270.65*" (OSWER Guidance Manual; EPA/530-SW-86-008)). This limit is placed on an RD&D treatment project because those projects are intended to be temporary experiments, and not long-term commercial operations. According to the federal guidance, an operating day is any fraction of a calendar day when conducting an RD&D experiment. In other words, even if treatment activities occur for only several hours on one day, the entire day is counted as an operating day. Because there are days when no treatment activities occur, the 365 operating days may not run consecutively. An RD&D permit can be renewed up to three times. Each such renewal is for a period of not more than one operating year.

The DBVS Facility RD&D draft permit has provided a 400 operating day limit for the RD&D treatment activities to provide the necessary time needed for the vitrification cycle of each campaign and for the efficient completion of the 50 proposed campaign plans. Ecology believes that the 400 operating days proposed is reasonable for the DBVS Facility operations and has made the decision not to include a provision in this RD&D permit for its renewal. The regulations provide Ecology with the authority to renew an issued RD&D permit a maximum of three times, each for a period of 365 operating days. This would be a total of 1,660 operating days (4 X 365 operating days) in contrast to the 400 operating days proposed under this RD&D draft permit. If the DBVS Facility wants to continue treatment activities authorized by this RD&D draft permit, the Permittee must apply for a final facility permit pursuant to WAC 173-303-806.

For the purposes of the DBVS Facility operating day, only "RD&D Treatment Activity" will be considered. The following will not be included when accounting for operating days: DBVS Facility construction; maintenance, repair, adjustment, or subsequent checkout operation of equipment not performed simultaneously with treatment, storage,

of dangerous and/or mixed waste; operating the DBVS Facility according to procedures and limits for treatability studies in compliance with WAC 173-303-071(3)(s), DBVS Facility ICV® box preparation and hook-up activities, prior to discharge of dangerous and/or mixed waste feed to the ICV® package disconnect. If more than one "RD&D Treatment Activity" is conducted at the facility on any given calendar day, that calendar day shall be counted as one operating day.

The second time limit sets a maximum three year term for the DBVS Facility permit during which the 400 operating days must be used. Ecology believes that the three year term will provide sufficient time for the DBVS to complete their experiments. Operating information around the country indicates that RD&D projects may require several years to complete. The three year term will give the DBVS Facility an opportunity to establish its facility under a stable set of permitting requirements. At the same time, Ecology wishes to limit the maximum term of this permit.

The time limits in this permit do not restrict Ecology from taking other actions if Ecology or the public has significant concerns about the safety of the DBVS Facility's operation. For example, Ecology could take any of the following actions:

- Order an immediate termination of operations at the facility if Ecology determined that to be necessary to protect human health and the environment. [See WAC 173-303-809(3) and Permit Condition I.C.4.]
- Initiate permit changes or revoke the permit to include new requirements. [See WAC 173-303-830(3) and Permit Condition I.C.1.]
- Take enforcement action against the DBVS facility if the DBVS Facility does not comply with the conditions of the permit. [See WAC 173-303-810(2) and Permit Condition I.E.1.]

## **G. CONCLUSION**

The ORP has demonstrated in their permit application that they are capable of safely operating an RD&D facility under the conditions required for a final permit. Therefore, Ecology has made the tentative decision to issue an RD&D permit to the facility. The permit includes the DBVS Facility's permit application and additional requirements Ecology has specified as permit conditions.

**PERMIT FOR  
DANGEROUS AND OR MIXED WASTE RESEARCH, DEVELOPMENT, AND  
DEMONSTRATION**

Department of Ecology  
Nuclear Waste Program  
3100 Port of Benton Boulevard  
Richland, Washington 99354-1670  
Telephone: (509) 372-7950

This Permit is issued in accordance with the applicable provisions of the Hazardous Waste Management Act, Chapter 70.105 Revised Code of Washington (RCW), and the regulations promulgated hereunder in Chapter 173-303 Washington Administrative Code (WAC).

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ISSUED TO: United States Department of Energy, Office of River Protection  
Owner/Operator  
P.O. Box 450  
Richland, Washington 99354

Co-Permittee: CH2M HILL Hanford Group, Inc.  
Co-Operator  
P.O. Box 1500  
Richland, Washington 99354

This Permit is effective as of **"effective date - TBD"** and shall remain in effect until **"insert date-TBD"** unless modified or revoked and reissued under WAC 173-303-830(3), or terminated under WAC 173-303-809(3) or WAC 173-303-830(5). This Permit shall not exceed 400 operating days of the Dangerous Waste Research, Development, and Demonstration Activity authorized by this permit.

ISSUED BY: WASHINGTON STATE DEPARTMENT OF ECOLOGY

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Michael A. Wilson, Program Manager  
Nuclear Waste Program  
Washington State Department of Ecology

Date Signed \_\_\_\_\_

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## INTRODUCTION

### **Permittees:**

Owner/Operator: United States Department of Energy, Office of River Protection

Facility Manager/Co-Operator: CH2M HILL Hanford Group, Inc.

**EPA/State Identification Number:** WA 7890008967

### **Pursuant to:**

Chapter 70.105 Revised Code of Washington (RCW), the Hazardous Waste Management Act of 1976, as amended, and regulations codified in Chapter 173-303-809 Washington Administrative Code (WAC).

A Permit is issued to the United States Department of Energy (USDOE), Office of River Protection (ORP) and CH2M HILL Hanford Group, Inc. (CH2M) (hereinafter called the Permittees), to operate a Dangerous Waste Research, Development, and Demonstration Facility for the Demonstration Bulk Vitrification System (DBVS Facility) west of the 241-S Tank Farm in the 200 West Area of the Hanford Site. This Permit is not a part of the Dangerous Waste Portion of the *Resource Conservation and Recovery Act of 1976* (RCRA) Permit for the Treatment, Storage, and Disposal of Dangerous Waste Permit issued to USDOE March 28, 2000.

The Permittees must comply with all terms and conditions set forth in this Permit and with Permit Attachments AA through LL. When the Permit and the attachments are in conflict, the wording of the Permit will prevail. The Permittees shall also comply with all applicable state regulations, including Chapter 173-303 WAC, and those specified in the Permit. Any procedure, method, data, or information contained in this document that relates to the radioactive source, byproduct material, and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954, as amended) is not provided for the purpose of regulating such components under the authority of this Permit and Chapter 70.105 RCW.

"Applicable state and federal regulations" are those which are in effect on the date of final administrative action on this Permit and any self-implementing statutory provisions and related regulations which, according to the requirements of RCRA (as amended) or state law, are automatically applicable to the Permittees' dangerous waste management activities notwithstanding the conditions of this Permit.

This Permit is based upon the Administrative Record, as required by WAC 173-303-840. The Permittees' failure in the application or during the Permit issuance process to fully disclose all relevant facts, or the Permittees' misrepresentation of any relevant facts at any time, shall be grounds for the termination or modification of this Permit and/or initiation of an enforcement

action, including criminal proceedings. The Permittees shall inform the Director of the Washington State Department of Ecology (hereafter called the Director) of any deviations from permit conditions or changes from information provided in the Research, Development, and Demonstration Permit Application. In particular, the Permittees shall inform the Director of any proposed changes that might affect the ability of the Permittees to comply with applicable regulations and permit conditions or that alter any of the conditions of the Permit in any way.

The Washington State Department of Ecology (hereafter called Ecology) will enforce all conditions of this Permit, based on federal regulations for which the State of Washington has received final authorization and all conditions that are state-only requirements (i.e., required by state regulations, but not by federal regulations). Any challenges of any permit condition that concern state requirements (i.e., conditions of this Permit for which the State of Washington is authorized or conditions which are state-only requirements) shall be appealed to the Pollution Control Hearings Board in accordance with WAC 173-303-845. In the event that Ecology does not maintain its authorization for the state Hazardous Waste Program under RCRA, then the U.S. Environmental Protection Agency (EPA) will enforce all permit conditions except those that are state-only requirements.

### LIST OF ATTACHMENTS

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions:

Attachment AA	Facility Description - Section 2 of the Permit Application
Attachment BB	Waste Analysis Plan - Section 6 of the Permit Application; and Analytical Methods - Appendix D of the Permit Application
Attachment CC	Personnel Training - Section 8 of the Permit Application
Attachment DD	Contingency Plan - Section 10 of the Permit Application; and Hanford Test and Demonstration Facility Contingency Plan - Appendix C of the Permit Application
Attachment EE	Closure Plan - Section 11 of the Permit Application
Attachment FF	Emergency Preparedness and Prevention – Following Sections of the Permit Application:  Section 2            Facility Description Section 4            Bulk Vitrification Test and Demonstration Facility Section 5            Operations Plan
Attachment GG	Recordkeeping and Reporting - Section 9 of the Permit Application
Attachment HH	RESERVED
Attachment II	Inspection Plan - Section 7 of the Permit Application
Attachment JJ	Container Management – Following Sections and Figures of the Permit Application:  Section 2.3.2        Waste Retrieval and Storage Section 2.4          Treated Waste Packaging Section 4.2.9        Vitrification Container Preparation Section 4.2.10       In-Container Vitrification Section 4.2.11       Post-Vitrification Activities

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**Attachment KK**      Tank Management – Following Sections, Figures, and Appendices of the Permit Application:

Section 2.2.1	Bulk Vitrification System Components
Section 2.3.2	Waste Retrieval and Storage
Section 2.3.3	Waste Transfer
Section 2.6	Secondary Wastes
Section 4	Bulk Vitrification Test and Demonstration Facility
Section 7.2.3	Daily Inspections
Section 7.4	Corrective Action
Section 7.5	Recordkeeping
Figure 2-2	Test and Demonstration Facility Site and Equipment Layout – Page 1
Figure 2-4	Waste Retrieval System for Phase 1 and Phase 2
Figure 7-2	Typical Inspection Checklist for Waste Tank Storage Area
Appendix B	Process Flow Diagrams

**Attachment LL**      Demonstration Bulk Vitrification System - Following Sections and Appendices of the Permit Application:

Section 4	Bulk Vitrification Test and Demonstration Facility
Section 5	Operations Plan
Appendix B	Process Flow Diagrams
Appendix E	Emergency Condition Parameter Limit Values
Appendix F	ICV® Container Refractory Information

### DEFINITIONS

For purposes of this joint Permit, the following definitions shall apply:

- a. The term "**Batch**" means a quantity of material prepared in the mixer/dryer that consists of tank waste, simulants, soil, and/or additives that are transferred into the ICV® container for treatment.
- b. The term "**Blending**" means the mixing of the untreated waste with simulants that mimic certain characteristics of the untreated waste.
- c. The term "**Business Day**" means calendar day, excluding weekends and state and federal holidays.
- d. The term "**Calendar Day**" means any day, including state and federal holidays.
- e. The term "**Campaign**" means the receipt, processing, and vitrification of waste into a single ICV® container. Multiple batches from the mixer/dryer may be transferred into an ICV® container.
- f. The term "**Campaign Plan**" means a written plan for each campaign that is developed by the Permittees to include the information required of this Permit, that is submitted to Ecology for review and approval.
- g. The term "**Dangerous Waste**" means a waste designated in WAC 173-303-040 through 173-303-100 as dangerous, or extremely hazardous or mixed waste.
- h. The term "**Director**" means the Director of the Washington State Department of Ecology or a designated representative.
- i. The term "**DBVS Facility**" means that property identified in the physical description of the area (including all contiguous land, structures, appurtenances, and improvements) used to manage dangerous and/or mixed waste. This property description is as set forth in Attachment AA of this Permit and includes the DBVS listed in Permit Tables V-1 and V-4.
- j. The term "**Ecology**" means the Washington State Department of Ecology (with the address as specified on page one of this Permit).
- k. The term "**Hazardous Waste**" means a waste as defined in WAC 173-303-040.
- l. The term "**ICV® Container**" or "**ICV® Box**" means a steel box approximately 3.0 m (10 feet) high, 2.4 m (8 feet) wide, and 7.3 m (24 feet) long.
- m. The term "**ICV® Package**" means a complete ICV® container that includes refractory materials, waste and/or stimulant, glass formers, electrodes, and lid.

- n. The term **"Independent Qualified Registered Professional Engineer (IQRPE)"** means a person who is licensed by the state of Washington, or a state which has reciprocity with the state of Washington as defined in RCW 18.43.100, and who is not an employee of the owner or operator of the facility for which construction or modification certification is required. A qualified professional engineer is an engineer with expertise in the specific area for which a certification is given (WAC 173-303-040).
- o. The term **"Operating Day"** means any fraction of a calendar day when conducting "RD&D Treatment Activity" at the DBVS Facility. For the purposes of accounting for an "Operating Day," only "RD&D Treatment Activity" must be considered. The following will not be included when accounting for operating days: DBVS Facility construction; maintenance, repair, adjustment, or subsequent checkout operation of equipment not performed simultaneously with treatment and storage of dangerous and/or mixed waste; operating the DBVS Facility according to procedures and limits for treatability studies in compliance with WAC 173-303-071(3)(s), DBVS Facility ICV® Box Preparation and Hook-up Activities, prior to discharge of dangerous and/or mixed waste feed to the ICV® container, and DBVS Facility activities after ICV® Package disconnect. If more than one "RD&D Treatment Activity" is conducted at the facility on any given calendar day, that calendar day shall be counted as one operating day.
- p. The term **"Permittees"** means the United States Department of Energy, Office of River Protection, and CH2M HILL Hanford Group, Inc. (with the addresses as specified on page one of this Permit).
- q. The term **"RD&D Operations"** means the DBVS Facility.
- r. The term **"Test and Demonstration Facility"** means the DBVS Facility permitted under this RD&D Permit that is located west of the 241-S Tank Farm where the Bulk Vittrification System will be tested and demonstrated.
- s. The term **"DBVS"** as defined in Tables V.1. and V.4.
- t. The term **"Permit"** means the DBVS Research, Development, and Demonstration Permit issued by the Washington State Department of Ecology pursuant to Chapter 70.105 RCW and Chapter 173-303 WAC.
- u. All definitions contained in WAC 173-303-040 are hereby incorporated, in their entirety, by reference into this Permit. Any of the definitions used above, (a) through (t), shall supersede any definition of the same term given in WAC 173-303-040. Where terms are not defined in the regulations or the Permit, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

### ACRONYMS

AEA .....	<i>Atomic Energy Act of 1954</i>
ALARA .....	as low as reasonably achievable
API .....	American Petroleum Institute
ASCE .....	American Society of Civil Engineers
AWFCO .....	automatic waste feed cut-off
AWTE .....	ancillary waste transfer enclosure
BACT .....	best available control technology
BBI .....	Best Basis Inventory
CERCLA .....	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
CEM .....	continuous emission monitoring
CEMS .....	continuous emission monitoring system
CFR .....	<i>Code of Federal Regulations</i>
CH2M or CH2M HILL .....	CH2M HILL Hanford Group, Inc.
Ci .....	curies
CO .....	carbon monoxide
COCs .....	contaminants of concern
Cs-137 .....	cesium-137
DBVS .....	Demonstration Bulk Vitrification System
DRE .....	destruction and removal efficiency
dscf .....	dry standard cubic feet
dscm .....	dry standard cubic meter
DQO .....	Data Quality Objectives
DOE .....	United States Department of Energy
DOE-ORP .....	United States Department of Energy, Office of River Protection
DOE-RL .....	United States Department of Energy Richland Operations Office
DST .....	double-shell tank
Ecology .....	Washington State Department of Ecology
EHW .....	extremely hazardous waste
EPA .....	United States Environmental Protection Agency
ESP .....	Environmental Simulation Program
ETF .....	Effluent Treatment Facility
FHA .....	final hazard analysis
ft .....	foot
ft <sup>3</sup> .....	cubic foot

gpm	gallons per minute
HEPA	high-efficiency particulate air
HFFACO	<i>Hanford Federal Facility Agreement and Consent Order</i>
HIHTL	hose-in-hose transfer line
HSWA	<i>Hazardous and Solid Waste Amendment of 1984</i>
ICV®	in-container vitrification (licensed process)
IDF	Integrated Disposal Facility
ILAW	immobilized low-activity waste
IQRPE	Independent Qualified Registered Professional Engineer
kg	kilogram
L	liter
lb	pound
L/min	liters per minute
LAW	low-activity waste
LDR	Land Disposal Restrictions
m	meter
m <sup>3</sup>	cubic meter
M	molar
min	minutes
MS/MSD	matrix spike/matrix spike duplicate
MTCA	<i>Model Toxics Control Act</i>
Na	sodium
NCi	nanocuries
NCR	Nonconformance Report
NOx	nitrogen oxides
NRC	Nuclear Regulatory Commission
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
P&P	preparedness and prevention
PER	Problem Evaluation Request
pH	a measure on a scale from 0 to 14 of the acidity or alkalinity of a solution
ppm	parts per million
ppmv	parts per million by volume
QA/QC	Quality Assurance/Quality Control
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCW	<i>Revised Code of Washington</i>

RD&D .....research, development, and demonstration  
REDOX.....reduction and oxidation  
SAP .....Sampling and Analysis Plan  
SCR.....selective catalytic reduction  
SOx .....sulfur oxides  
SST.....single-shell tank  
TBD.....to be determined  
TEQ.....toxicity equivalence  
TSD.....treatment, storage, and disposal  
UBC .....Uniform Building Code  
USDOE .....United States Department of Ecology  
WAC .....*Washington Administrative Code*  
WAP.....Waste Analysis Plan  
WFQ.....waste form qualification  
WRS.....Waste Retrieval System  
WTP.....Waste Treatment Plant

## **PART I – STANDARD CONDITIONS**

### **IA. EFFECT OF PERMIT**

The Permittees are authorized to store and treat dangerous waste in accordance with the conditions of this Permit and the applicable provisions of Chapter 173-303 WAC. Any storage or treatment of dangerous and/or mixed waste by the Permittees at this facility that is not authorized by this Permit or by WAC 173-303-809 and for which a permit is required under WAC 173-303-800 is prohibited. Issuance of this Permit does not convey any property rights of any sort or any exclusive privilege [WAC 173-303-810(8)(b)]. Issuance of this Permit does not authorize any injury to persons or property, any invasion of other private rights, or any infringement of state or local law or regulations [WAC 173-303-810(8)(c)].

### **IB. GENERAL PERMIT CONDITIONS**

I.B.1. The general permit conditions under WAC 173-303-810, and final facility standards under WAC 173-303 as set forth in WAC 173-303-600, are incorporated as specified in this Permit and shall be adhered to by the Permittees. The Permittees shall also comply with any self-implementing statutory provisions, which according to the requirements of state law, are automatically applicable to the Permittees' dangerous and/or mixed waste activity, notwithstanding the conditions of this Permit.

I.B.2. The attachments listed on Permit pages seven (7) and eight (8) are incorporated by reference into this Permit. Facility operations shall be in accordance with the contents of the Permit attachments, as revised by this Permit.

### **IC. PERMIT ACTIONS**

I.C.1. This Permit may be modified, revoked, or terminated by Ecology for cause as specified in WAC 173-303-830(3), (4), and (5) and WAC 173-303-809. The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittees shall not stay the applicability or enforceability of any condition [WAC 173-303-810(7)].

#### **I.C.2. Permittee Initiated Modifications**

Permit modifications pursuant to this Permit for dangerous and/or mixed waste, at the request of the Permittees, must be done according to the three tiered modification system specified in WAC 173-303-830(4) and Condition I.C.3. The permit modification request must include page changes to the Permit, attachments, and Permit Application supporting documentation necessary to incorporate the proposed permit modification and a draft with changes clearly noted in red-line strikeout to Ecology for review and approval.

I.C.3. In addition to other requirements in WAC 173-303-830, within forty-five (45) days of a permit change (i.e., permit modification) being put into effect or approved, the Permittees shall retype the relevant portions of the Permit and attachments, to incorporate the change (if not already reflected in the change pages submitted in the original permit modification request) and submit the reprinted pages. This submittal does not require certification described in WAC 173-303-810(13).

I.C.4. Ecology may order an immediate termination of all operations at the facility at any time it determines that termination is necessary to protect human health and the environment in accordance with WAC 173-303-809(3).

I.D. SEVERABILITY

I.D.1. Effect of Invalidation

The provisions of this Permit are severable. If any provision of this Permit, or the application of any provision of this Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby. Invalidation of any state or federal statutory or regulatory provision which forms the basis for any condition of this Permit does not affect the validity of any other state or federal statutory or regulatory basis for said condition.

I.E. DUTIES AND REQUIREMENTS

I.E.1. Duty to Comply

The Permittees shall comply with all conditions of this Permit [WAC 173-303-810(2)], except to the extent and for the duration such noncompliance is authorized by an emergency permit issued under WAC 173-303-804. Any permit noncompliance, other than noncompliance authorized by an emergency permit, constitutes a violation of Chapter 173-303 WAC and/or RCRA and is grounds for: a) enforcement action; b) termination of this Permit; c) revocation and re-issuance of this Permit; d) modification of this Permit; or e) denial of a permit renewal application.

I.E.2. Need to Halt or Reduce Activity Not a Defense

A Permittee who has not complied with this Permit, and who subsequently is subject to enforcement actions, may not argue that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit [WAC 173-303-810(4)].

I.E.3. Duty to Mitigate

The Permittees must take all steps required by Ecology to minimize or correct any adverse impacts on the environment resulting from non-compliance with the Permit. Such mitigation shall not be a defense to enforcement [WAC 173-303-810(5)].

I.E.4. Proper Operation and Maintenance

The Permittees shall at all times properly operate and maintain all facilities and all systems of treatment and control which are installed or used by the Permittees to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control (QA/QC) procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit [WAC 173-303-810(6)].

I.E.5. Duty to Provide Information

The Permittees shall furnish to Ecology, within a reasonable time, any information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittees shall also furnish to Ecology, upon request, copies of records required to be kept by this Permit [WAC 173-303-810(9)].

I.E.6. Inspection and Entry

Pursuant to WAC 173-303-810(10), the Permittees shall allow representatives of Ecology upon the presentation of proper credentials to:

- I.E.6.a. During operating hours, and at all other reasonable times, enter the DBVS Facility or any unit or area within the DBVS Facility, where regulated activities or equipment are located or conducted, or where records must be kept under the conditions of this Permit;
- I.E.6.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;
- I.E.6.c. Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

I.E.6.d. Sample or monitor, at reasonable times, for the purposes of assuring Permit compliance or as otherwise authorized by state law as amended, any substances or parameters at any location.

I.E.7. Anticipated Non-Compliance

The Permittees shall give advance notice, to Ecology, of any planned changes in the permitted facility or activity which may result in noncompliance with Permit requirements. Prior to the implementation of the planned change(s), the Permittee must receive Ecology approval.

I.E.8. Reporting Planned Changes

The Permittees shall give advanced notice to Ecology, as soon as possible, of any planned physical alterations or additions to the facility subject to this Permit. Such notice does not authorize any noncompliance with or modification of this Permit.

I.E.9. Certification of Construction or Modification

The Permittees may not commence treatment or storage of dangerous and/or mixed waste in any new or modified portion of the facility, until the Permittees have submitted to Ecology, by certified mail or hand delivery:

I.E.9.a. A letter signed by the Permittees and a registered professional engineer stating that the facility has been constructed or modified in compliance with the Permit; and

I.E.9.a.i. Ecology has inspected the modified or newly constructed facility and finds it is in compliance with the conditions of the Permit; or

I.E.9.a.ii. Ecology has either waived the inspection or has not within fifteen (15) business days of the receipt of the Permittees' letter, notified the Permittees of intent to inspect.

I.E.10. Other Information

Whenever the Permittees become aware that they failed to submit relevant facts in the Permit Application or submitted incorrect information in a Permit Application or in any report to Ecology, the Permittees shall promptly submit such facts or information [WAC 173-303-810(14)(h)].

I.F. MONITORING, RECORDS, AND REPORTING

I.F.1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed must be the appropriate method from WAC 173-303-110, or an equivalent method approved by Ecology.

Laboratory methods must be those specified in WAC 173-303-110(3)(a), other alternate methods approved in this Permit (e.g., Permit Attachment BB), or an equivalent method in accordance with Permit Condition I.F.2. of this Permit.

I.F.2. The Permittees may substitute analytical methods that are equivalent or superior to those specifically approved for use in this Permit in accordance with the following:

I.F.2.a. The Permittees must submit to Ecology a request for substitution of analytical method(s) specifically approved for use in this Permit. The request shall provide information demonstrating that the proposed method(s) requested to be substituted are equivalent or superior in terms of sensitivity, accuracy, and precision (i.e., reproducibility); and

I.F.2.b. The Permittee receives a written approval from Ecology for the substitution of analytical method(s). Such approval shall not require a permit modification under WAC 173-303-110.

I.F.3. Pursuant to WAC 173-303-810(11), records of monitoring information shall specify:

I.F.3.a. The dates, exact place, and times of sampling or measurements;

I.F.3.b. The individuals who performed the sampling or measurements;

I.F.3.c. The date(s) analyses were performed;

I.F.3.d. The individuals who performed the analyses;

I.F.3.e. The analytical techniques or methods used; and

I.F.3.f. The results of such analyses, including the QA/QC results and requirements.

I.F.4. Immediate Reporting

The Permittees shall immediately report to Ecology any release, fire, explosion, natural disaster, or incident of noncompliance with this Permit that may endanger human health or the environment. This reporting shall meet the requirements in WAC 173-303-360(2)(d) and WAC 173-303-810(14)(F).

I.F.5. Incident Reporting

Within five (5) calendar days of an incident that requires implementation of the Contingency Plan, the Permittees shall submit a written report of the incident to the Director meeting the requirements of WAC 173-303-360(2)(k) and WAC 173-303-810(14)(f).

- I.F.6. The Permittees shall report to Ecology all incidents of noncompliance with this Permit, other than incidents specified in Permit Conditions I.F.3., I.F.4., and I.F.5., every three (3) months. These reports shall meet the requirements in WAC 173-303-810(14)(g).
- I.F.7. Within thirty (30) days of a release to the environment from a dangerous waste tank system, the Permittees must send a written report that complies with WAC 173-303-640(7)(d)(iii).

I.G. COMPLIANCE NOT CONSTITUTING DEFENSE

Compliance with the terms of this Permit does not constitute a defense to any order issued or any action brought under any state or federal laws governing protection of public health or the environment. However, compliance with terms of this Permit does constitute a defense to any action alleging failure to comply with applicable standards upon which this Permit is based, or failure to operate under a permit required by WAC 173-303-800 with respect to those activities authorized by this Permit.

I.H. TRANSFER OF PERMITS

This Permit is not transferable to any person, except after notice to Ecology. In such instances, Ecology will require modification or revocation and reissuance of the Permit pursuant to WAC 173-303-830(2)(b).

I.I. PERMIT EXPIRATION

This Permit and all conditions herein are in effect as of the "effective date" as defined in the definitions of the Permit and will remain in effect until the expiration of 400 operating days or three (3) years, whichever is earlier. The effective date of the Permit will be established pursuant to WAC 173-303-840(8). This Permit may be modified or revoked as necessary in accordance with WAC 173-303-830(3). This Permit may not be reissued.

I.J. REPORTS, NOTIFICATIONS, AND SUBMISSIONS

All reports, notifications, or other submissions that are required by this Permit to be submitted to Ecology or the Director shall be sent certified mail or hand-delivered to:

Program Manager, Nuclear Waste Program  
Department of Ecology  
3100 Port of Benton Boulevard  
Richland, Washington 99354-1670  
Telephone: (509) 372-7950

The phone number and address may change, and such changes will be provided by Ecology. Such changes will not require a permit modification.

**I.K. SIGNATORY REQUIREMENTS**

All final reports, that are required by this Permit to be submitted to Ecology shall be signed and certified in accordance with WAC 173-303-810(12), (13), and (14).

**II.L. CONFIDENTIAL INFORMATION**

Any information submitted by the Permittees to Ecology may be claimed as confidential by the Permittees in accordance with applicable provisions of WAC 173-30-810(15).

**I.M. PERMIT RENEWAL**

If the Permittees wish to continue the activities authorized by this Permit beyond this Permit's expiration date, the Permittees must apply for a final facility permit pursuant to WAC 173-303-806.

**PART II – GENERAL FACILITY CONDITIONS**

**II.A. GENERAL WASTE MANAGEMENT**

**II.A.1.** The Permittees are authorized to accept dangerous and/or mixed waste only from:

**II.A.1.a.** Tank 241-S-109 that does not exceed the criteria listed in Permit Attachment BB, as specified in the Ecology approved campaign plan, and as specified on Permit Tables V.7 and V.8.

**II.A.2.** During operations of the DBVS, pursuant to Permit Part V, processing of materials (including simulants) in the DBVS that would designate as dangerous waste are fully subject to the requirements of this Permit, excluding the DBVS Facility Waste Receipt System (WRS) and DBVS tank systems as identified in Table IV.1. This exclusion does not apply to mixed waste.

**II.A.3.** Feed to the DBVS mixer/dryer and the ICV® container(s) limited as specified in Permit Attachments BB and LL, Permit Tables V.7 and V.8, and the Ecology approved DBVS Campaign Plan.

**II.A.4.** Air pollution control devices and capture systems in the DBVS Facility shall be maintained and operated so as to minimize the emissions of air contaminants and to minimize process upsets. Procedures for ensuring that the above equipment is properly operated and maintained, so as to minimize the emission of air

contaminants and process upsets, shall be established and followed in accordance with the Ecology approved DBVS Campaign Plan.

- II.A.5. The Permittees shall ensure that for all dangerous and/or mixed waste areas, systems, and units contained in the DBVS Facility that the DBVS offgas treatment systems shall be in operation prior to waste being introduced into these dangerous and/or mixed waste areas, systems, and units contained in the DBVS Facility. At any time the offgas treatment system ceases to operate or produces insufficient vacuum to recover emissions from the areas, systems, or units, the Permittees shall not commence any new treatment activities within the dangerous and/or mixed waste areas, systems, or units contained in the DBVS Facility and take measures to minimize evolution of emissions from on-going treatment, and shall not receive new dangerous and/or mixed waste shipments into the DBVS Facility. The Permittees shall not re-commence new treatment activities until the DBVS Facility offgas treatment systems are operational and producing sufficient vacuum to recover emissions.
- II.A.6. Containment systems for all waste management operations shall be constructed, operated, and maintained to ensure no spilled waste or storm water migrates outside of the containment areas. In particular, the following waste management operations must be within such containment areas:
- II.A.6.a. Loading and unloading of dangerous and/or mixed waste; and
- II.A.6.b. Staging and processing of dangerous and/or mixed waste.
- II.A.7. Design and Construction of the Facility
- The Permittees shall conduct all construction subject to this Permit in accordance with the approved designs, plans, and specifications that are required by this Permit, except as specified in Permit Conditions II.A.8. or II.A.9. For purposes of Permit Conditions II.A.8. and II.A.9., the Ecology representative will be an Ecology construction inspector, project manager, or other designated representative of Ecology.
- II.A.8. The Permittees shall submit a nonconformance report (NCR) to the Ecology representative, as applicable, within five (5) calendar days of the Permittees becoming aware of incorporation of minor nonconformance from the approved designs, plans, and specifications into the construction of the DBVS Facility. Such minor nonconformance shall be defined, for the purposes of this permit condition, as nonconformance that is necessary to accommodate proper construction and the substitution of the use of equivalent or superior materials or equipment that do not substantially alter permit conditions or reduce the capacity of the facility to protect human health or the environment. Such minor nonconformance shall not be considered a modification of this Permit. If Ecology determines that the nonconformance is minor, it will verbally notify the Permittees. If Ecology

determines that the nonconformance is not minor, it will notify the Permittees in writing whether prior approval is required from Ecology before work proceeds which affects the nonconforming item. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.

- II.A.9. Upon completion of the DBVS Facility construction subject to this Permit, the Permittees shall produce as-built drawings of the project which incorporate the design and construction nonconformance resulting from all change documentation, as well as changes made pursuant to Permit Condition II.A.8. The Permittees shall place the as-built drawings into the operating record within three (3) months of completing construction.

II.B. WASTE ANALYSIS

- II.B.1. The Permittees shall maintain adequate knowledge of any waste to be managed properly by the DBVS Facility before acceptance, after receipt, and during treatment and storage of these wastes. The Permittees will ensure this knowledge through compliance with the requirements of WAC 173-303-300 and with the provisions of the Waste Analysis Plan (WAP), Permit Attachment BB, [WAC 173-303-806(4)(a)(iii) and WAC 173-303-300(1)].
- II.B.2. When laboratory analytical methods are required to confirm the Permittees' knowledge of the waste, the Permittees must ensure that the sampling and test methods listed as acceptable by WAC 173-303-110, or equivalent methods approved in writing by Ecology, are used pursuant to Permit Conditions I.F.1. and I.F.2.
- II.B.3. The Permittees are responsible for obtaining accurate information for each waste stream. Inaccurate waste analysis information provided by the generating site (or unit) is not a defense for noncompliance by the Permittees with the waste management requirements and conditions of this Permit, WAC 173-303, and in Chapter 173-303-140.
- II.B.4. Records and results of waste analyses described in this Permit shall be maintained as described in Permit Condition II.G. The DBVS Facility operating record shall include, but not be limited to, information requirements for waste analysis in Permit Condition II.G.
- II.B.5. All dangerous and/or mixed wastes shall be managed only in areas authorized for dangerous waste management under the conditions of this Permit.
- II.B.6. The Permittees shall comply with requirements for waste analysis specified in Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8., for all waste transferred from Tank 241-S-109, and for all waste at the DBVS Facility to include simulants, and treated waste.

## II.B.7. COMPLIANCE SCHEDULES

The following amendments to Permit Attachment BB are hereby made. The Permittee shall submit the revised pages reflecting these amendments to Ecology prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility. These amendments do not constitute a permit modification pursuant to Permit Conditions I.C.2. and I.C.3.:

- II.B.7.a. Section 6.1, page 6-1, first paragraph, first sentence is revised as follows: "The Waste Analysis Plan (WAP) provides the basis for measuring the adequacy of waste treatment and assists in optimizing the waste treatment operation based on treated waste analysis results and offgas emissions."
- II.B.7.b. Section 6.1, page 6-1, second paragraph, first sentence is revised as follows: "The WAP objective is to develop a sampling approach for (1) the final vitrified waste form to ensure compliance with the waste acceptance criteria of the IDF or another permitted disposal facility, and the land disposal restrictions listed in WAC 173-303-140; (2) develop waste feed limitations that will result in the final vitrified waste form meeting (1) above and in addition meet the performance standards for offgas emissions in Section 6.4 of the RD&D Permit issued by Ecology. This second objective will be addressed in the Waste Form Qualification (WFQ) plans."
- II.B.7.c. Section 6.2, page 6-2, Table 6-1, is revised to include under Phase 1, Vitrified Waste Header "4" as a superscript and as footnote "4" as follows: "All constituents checked will be sampled/analyzed for each ICV® package generated during Phase 1."
- II.B.7.d. Section 6.2, page 6-2, Table 6-1, footnote "2" is revised as follows: "Analyze once per full waste receipt tank unless a reduced analysis frequency and/or scope is approved by Ecology."
- II.B.7.e. Section 6.2, page 6-2, Table 6-1, footnote "3" is revised as follows: "Analyze once per ICV® package for the initial 10 ICV® packages; subsequent frequency as specified in an Ecology approved WFQ plan."
- II.B.7.f. Section 6.2.4, page 6-8, second sentence, "These waste feed batches will be sampled for constituents in Table 6-1."
- II.B.7.g. Section 6.2.4, page 6-8, sixth sentence, "The analytical methods used for measuring concentrations will follow the analytical methods listed in Appendix D of the Permit Application; Permit Attachment BB."
- II.B.7.h. Section 6.2.5, page 6-9, second sentence, "The frequency of analysis of the waste during Phase 2 will be once per full DBVS waste receipt tank or as specified in an Ecology approved WFQ plan."

- II.B.7.i. Section 6.2.5.1, page 6-9, first paragraph, last sentence is revised as follows: "The frequency of sampling of ICV® packages will be once for the initial ten (10) ICV® packages; subsequent frequency as specified in an Ecology approved WFQ plan."
- II.B.7.j. Section 6.2.5, page 6-10, Table 6-7, footnote "1" is revised as follows: "All tests will be performed as specified in an Ecology approved WFQ plan."
- II.B.7.k. Section 6.5.1.1, page 6-11, third sentence is revised as follows: "The analytical methods and the associated QA/QC are specified in Appendix D of the Permit Application, Permit Attachment BB."
- II.B.7.l. Section 6.5.2, page 6-11, sixth sentence, "At a minimum, at least one trip blank will accompany each shipment per sample type to the laboratory."
- II.B.7.m. Section 6, page 6-13, Figure 6-1, the block entitled "WRS" is deleted.
- II.B.7.n. Section 6, page 6-13, Figure 6-1, the block entitled "Waste Feed," the narrative under "Sampling Point" is revised as follows:  
    "Phase 1: Waste staging tank"  
    "Phase 2: Liquid waste pump skid for the DBVS Facility waste and simulant staging tanks."  
  
    "Purpose of Feed Sampling" is amended to include the following: "Provide mass balance information"
- II.B.7.o. Section 6, page 6-13, Figure 6-1, the block entitled "Offgas Treatment System" is amended to also include the following:  
  - RD&D Permit issued by Ecology under WAC 173-303-809 for the DBVS Facility.
- II.B.7.p. Section 6, page 6-13, Figure 6-1, the block entitled "Treated Waste," the narrative under "Sampling Point," replace with: "ICV® Package."
- II.B.7.q. Section 6, page 6-13, Figure 6-1, the block entitled "Secondary Liquid Effluent," the narrative under "Purpose of Waste Sampling" is amended to include "and provide mass balance information."
- II.B.7.r. Section 6, page 6-13, Figure 6-1, the block entitled "Treated Waste," the narrative under "Sampling Frequency" is revised as follows: "Once per ICV® package for the initial ten (10) ICV® packages; subsequent frequency as specified in an Ecology approved WFQ plan."  
  
    "Purpose of Feed Sampling" is amended to include the following: "Provide mass balance information."

- II.B.7.s. Section 6, page 6-13, Figure 6-1, the block entitled "Secondary Liquid Effluent," the narrative under "Sampling Point" is revised as follows: "Effluent Holding Tanks."
- II.B.7.t. Section 6, page 6-13, Figure 6-1, the block entitled "Secondary Liquid Effluent," the narrative under "Sampling Frequency" is revised as follows: "Every tanker truckload during startup (3 batches) as required by the ETF Disposal Facility for mass balance as specified in the approved WFQ Plan."
- II.B.7.u. Section 6, page 6-13, Figure 6-1, the block entitled "Secondary Liquid Effluent," the narrative under "Analytical Methods Will Measure" is amended to include the following: "Appendix D of the Permit Application; Permit Attachment BB for mass balance information."
- II.B.7.v. Section 6, page 6-13, Figure 6-1, the block entitled "Solid Secondary Waste," the narrative under "Purpose of Waste Sampling" is amended to include the following: "and provide mass balance information."
- II.B.7.w. Section 6, page 6-13, Figure 6-1, the block entitled "Solid Secondary Waste," the narrative under "Sampling Point, Sampling Method, and Sampling Frequency" is revised as follows: "Meet the Waste Acceptance Criteria of a Disposal Facility."
- II.B.7.x. Section 6, page 6-13, Figure 6-1, the block entitled "Solid Secondary Waste," the narrative under "Analytical Methods Will Measure" is amended to include the following: "Appendix D of the Permit Application; Permit Attachment BB for mass balance information."
- II.B.7.y. Section 6, page 6-13, Figure 6-1, under "Assumptions," revise third bullet as follows: "Waste Analysis for compliance with WAC 173-303-395 will be determined pursuant to the RD&D Permit issued by Ecology."
- II.B.8. Prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility, Permittees shall submit and receive written approval from Ecology for the following revisions of Permit Attachment BB. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:
- II.B.8.a. Amend the sampling, analysis, and QA/QC procedures to address any sumps that are part of secondary containment systems for the DBVS Facility storage and treatment units.
- II.B.8.b. Amend to include, "Sampling and analysis for those others and QA/QC procedures and sampling frequency for the parameters identified in Section 6.2.3.4, 1 through 3, and in Table 6-2 for Phase 1."
- II.B.8.c. Amend to include an Appendix specifying limitations for the ICV® packages addressing at a minimum the following:

- II.B.8.c.i. Size, durability, compressibility, stacking, handling, retrievability from storage and after final disposal, outside and inside package residual contamination, and disposal facility testing/acceptance requirements.
- II.B.8.d. Prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall submit to Ecology for approval, and strictly for this RD&D Permit, documentation, not based solely on process knowledge that shows the removal of the characteristic codes D001 and D003 from S-109 tank waste.
- II.B.9. Prior to the initial receipt of dangerous and/or mixed waste in the DVBS Facility, the Permittees shall submit Section 2 of Permit Attachment AA amended to include the following specified as "for information only." These amendments do not constitute a permit modification pursuant to Permit Conditions I.C.2. and I.C.3.:
- II.B.9.a. A description of all ninety (90) day storage and satellite accumulation areas within the DBVS Facility.
- II.B.9.b. A description of each waste to be located in the areas designated in "a" above.
- II.B.9.c. A map clearly depicting the areas designated in "a" above.

II.C. PREPAREDNESS AND PREVENTION

- II.C.1. In accordance with WAC 173-303-340, the facility shall be designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or any unplanned release, sudden or non-sudden, of dangerous and/or mixed waste or dangerous waste constituent to air, soil, or surface or groundwater that could threaten human health or the environment.
- II.C.2. The Permittees shall ensure all water related safety equipment, such as eyewash units and emergency showers, remain operable at all times, including during periods of subfreezing temperatures.
- II.C.3. The Permittees shall comply with WAC 173-303-340(4) and WAC 173-303-355(1) pertaining to arrangements with local authorities.
- II.C.4. The Permittees shall comply with Permit Attachment FF [WAC 173-303-340].

II.C.6. COMPLIANCE SCHEDULES

Prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall submit and receive written approval from Ecology for incorporation in Permit Attachment FF, of the following, with the exception of II.C.6.a.viii. A., which will be incorporated into the Permit Administrative Record.

Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:

- II.C.6.a. Description of procedures, structures, or equipment used at the facility to:
  - II.C.6.a.i. Prevent hazards and contain spills in unloading/loading operations (e.g., ramps, berms, pavement, special forklifts);
  - II.C.6.a.ii. Prevent run-off from dangerous and/or mixed waste handling areas to other areas of the facility or environment, or to prevent flooding (e.g., berms, dikes, trenches);
  - II.C.6.a.iii. Prevent contamination of water supplies;
  - II.C.6.a.iv. Mitigate effects of equipment failure and power outages;
  - II.C.6.a.v. Prevent undue exposure of personnel to dangerous and/or mixed waste (e.g., protective clothing);
  - II.C.6.a.vi. Prevent releases to the atmosphere; and
  - II.C.6.a.vii. Test and maintain equipment to assure proper operation in the event of an emergency pursuant to WAC 173-303-340(1).
  - II.C.6.a.viii. A description of precautions to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes as required to demonstrate compliance with WAC 173-303-395, including documentation demonstrating compliance with WAC 173-303-395(1)(c), to include, at a minimum, the following:
    - A. USDOE "Final Hazard Analysis (FHA) for Demonstration Bulk Vitrification System (DBVS)." If the FHA is not completed prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility the Preliminary Hazard Analysis (PHA) shall be submitted and the FHA shall be submitted to replace it when it is completed.
    - B. Operating Procedures and/or waste feed limitations that will be followed and incorporated into Permit Attachment BB and/or Permit Attachment FF (Preparedness and Prevention) to assure flammable/toxic gases will not accumulate in any of DBVS Facility storage or treatment units/systems at hydrogen gas levels above the lower explosive limit.
    - C. Operating parameters to be monitored/controlled and limitations for these parameters addressing each DBVS Facility storage and treatment unit for waste compatibility, safe operation, and compatibility with unit materials of construction. Amend Permit Attachment BB to include these parameters and the monitoring frequency.

**II.D. INSPECTION PLAN**

**II.D.1.** The Permittees shall include inspections for all DBVS Facility dangerous and/or mixed waste management units specified in Permit Parts III, IV, and V to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of dangerous waste constituents to the environment, or a threat to human health. Inspections must be conducted in accordance with the DBVS Facility Inspection Schedule, Permit Attachment II [WAC 173-303-320].

**II.D.2. COMPLIANCE SCHEDULE**

Prior to the receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall update and resubmit and receive written approval from Ecology of the Inspection Schedule in Permit Attachment II. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. The revised schedule shall include, but not be limited to, a through c below. In addition, the Permittees shall submit to Ecology for incorporation into the Administrative Record, the basis for developing Inspection Schedule frequencies.

**II.D.2.a.** Detailed dangerous and/or mixed waste management unit specific and general inspection schedules and description of procedures (not examples) pursuant to WAC 173-303-630(6), 173-303-640(3)(c) and (6), and 173-303-670(7)(b) in accordance with WAC 173-303-680(3). The inspection schedule shall be presented in the form of a table (not typical) that includes a description of the inspection requirement, inspection frequency, and types of problems to look for during the inspections;

**II.D.2.b.** Integrity assessment program and schedule for all tanks under Permit Part IV and the DBVS under Part V of this Permit shall address the conducting of periodic integrity assessments over the life of the units, in accordance with WAC 173-303-640(3)(b), and descriptions of procedures for addressing problems detected during integrity assessments. The schedule must be based on past integrity assessments, age of unit, materials of construction, characteristics of the waste, and any other relevant factors [WAC 173-303-640(3)(b)]; and

**II.D.2.c.** Inspection schedules for all tanks under Permit Part IV and the DBVS under Permit Part V which have leak detection system and control instrumentation to include, but is not limited to valves, pressure devices, flow devices, measuring devices, as specified in Permit Conditions IV.A.4.b. and V.A.1.n.

**II.E. TRAINING**

**II.E.1.** The Permittees shall ensure that the DBVS Facility is operated and maintained at all times by persons who are trained and qualified to perform these and any other duties that may reasonably be expected to directly affect emissions from the DBVS Facility [WAC 173-303-680(2)] and in accordance with WAC 173-303-330.

II.E.2. The Permittees shall conduct personnel training in accordance with the training program, Permit Attachment CC.

II.E.3. COMPLIANCE SCHEDULE

Prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility units, the Permittees shall update and resubmit and receive approval from Ecology for the Training Program description in Permit Attachment CC. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. The revised Training Program description shall include, but not be limited to:

II.E.3.a. Detailed unit specific and general training program descriptions (not typical) consistent with WAC 173-303-806(4)(a)(xii).

II.E.3.b. Sufficient detail to document that the training and qualification program for all categories of personnel whose activities may reasonably be expected to directly affect emissions from DBVS, except control room operators, is appropriately consistent with 40 CFR 63.1206(c)(6)(ii), and for control room operators, is appropriately consistent with 40 CFR 63.1206(c)(6)(i) and 63.1206(c)(6)(iii) through 63.1206(c)(6)(vi) [WAC 173-303-680(2)] from WAC 173-303-806, as implemented in WAC 173-303-330(1).

II.F. CONTINGENCY PLAN

II.F.1. The Permittee shall comply with the requirements of WAC 173-303-350(4) for maintaining copies of the Contingency Plan, Permit Attachment DD, at the DBVS Facility, and providing copies to the authorities listed therein.

II.F.2. At all times, the Permittees shall have qualified persons designated as the emergency coordinator and alternate emergency coordinators.

II.F.3. The Permittees shall immediately carry out applicable provisions of Permit Attachment DD, pursuant to WAC 173-303-360(2), whenever there is a release of dangerous and/or mixed waste or dangerous waste constituents, or other emergency circumstance, any of which threatens human health or the environment.

II.F.4. COMPLIANCE SCHEDULE

The following amendment to Permit Attachment DD, is hereby made. The Permittee shall submit the revised page reflecting this amendment to Ecology prior to the initial receipt of dangerous and/or mixed waste. This amendment does not constitute a permit modification pursuant to Permit Conditions I.C.2. and I.C.3.:

Page C-10, Figure C-2, Tank No. "32-D74-004" is renumbered Tank No. "32-D74-016."

II.F.5. Prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall update and resubmit and receive written approval from Ecology of Permit Attachment DD to be consistent with design details and schedule described in Parts III, IV, and V and Attachments JJ, KK, and LL of this Permit. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.

II.F.6. After initial receipt of dangerous and/or mixed waste, the Permittees shall review and amend, if necessary, the applicable portions of the Contingency Plan, Permit Attachment DD, in accordance with the provisions of WAC 173-303-350(5) and WAC 173-303-830(4). The amended Contingency Plan shall be submitted to Ecology as a permit modification pursuant to Permit Conditions I.C.2. and I.C.3.

II.F.7. Prior to the initial receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall revise, resubmit, and receive written approval from Ecology of Permit Attachment DD to include the following. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:

II.F.7.a. Sections C.8.1, C.8.2, C.8.4, C.11.0, amended to provide the information currently designated "TBD" and/or "(to be determined)."

II.F.7.b. Section C.3.1, page C-4, Table C-1, amended to include a current list of names, addresses, and phone numbers (office and home available through the Hanford Patrol Operation Center) of all persons qualified to act as the emergency coordinator required under WAC 173-303-360(1). Where more than one person is listed, one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternates.

II.G. RECORDKEEPING AND REPORTING

II.G.1. In addition to the recordkeeping and reporting requirements specified elsewhere in this Permit, including Permit Attachment GG, the Permittees shall comply with all the applicable notification, certification, and recordkeeping requirements described in WAC 173-303-380(l)(j), (k), (m), and (o).

II.G.2. The Permittees shall maintain a written operating record at the DBVS Facility in accordance with WAC 173-303-380(i) consisting of records kept for the length of time specified below. Also, the Permittees shall record all information referenced in this Permit in the operating record within two (2) business days of the information becoming available. The operating record shall include, but is not limited to, the information listed below:

II.G.2.a. The following records shall be maintained until final closure is complete and certification is accepted by Ecology:

- II.G.2.a.i. An up-to-date map showing the locations where dangerous and/or mixed wastes are managed within the facility;
- II.G.2.a.ii. Written reports pursuant to Permit Condition II.F., Contingency Plan, and WAC 173-303-360(2)(k) of all incidents that require implementation of the Contingency Plan, Permit Attachment DD;
- II.G.2.a.iii. Record of spills and releases;
- II.G.2.a.iv. Written reports and records of immediate notification to the Director to address releases, fires, and explosions [WAC 173-303-810(14)(f)];
- II.G.2.a.v. Summaries of all records of corrective action;
- II.G.2.a.vi. All other environmental permits;
- II.G.2.a.vii. Records and results of waste analyses required by Permit Attachment BB and WAC 173-303-380(1)(c) that include, at a minimum:
  - The date(s), exact location, and times of sampling or measurements;
  - The name(s) of the individual(s) who performed the sampling or measurements;
  - The date(s) analyses were performed demonstrating that EPA SW-846 holding times were satisfied;
  - The name of the individual(s) who performed the analyses;
  - The analytical techniques or methods used;
  - The analytical results;
  - The QA/QC results and requirements; and
  - The unique identity of the equipment or instrument used for the analysis including the type/model number and either the serial number or the inventory number; and
- II.G.2.a.viii. Training records of facility personnel.
- II.G.2.b. The following records shall be maintained for a minimum of five (5) years. This time period may be extended by the Director in the event of enforcement action or notification by the Director that an investigation is ongoing. In the case of notification of investigation/inspection, the Permittees will not be required to keep the records longer than one (1) year past the normal timeframe unless an

enforcement action is issued:

- II.G.2.b.i. Facility operation and maintenance records and reports prepared pursuant to this permit;
- II.G.2.b.ii. Date(s) and methods(s) of treatment used for waste process operation including name(s) of personnel performing actual operation;
- II.G.2.b.iii. Progress reports and any required notifications prepared pursuant to this Permit;
- II.G.2.b.iv. The notice and certification required of a generator under WAC 173-303-140 (Land Disposal Restrictions);
- II.G.2.b.v. Records of all inspection and monitoring information meeting requirements of WAC 173-303-320(2)(d), and this Permit including, at a minimum, the following calibration and maintenance records:
  - The date(s) and time(s) of data recording;
  - The name of the person taking and recording the information; and
  - The recorded information itself whether consisting of observation, data measurement, instrument reading, or any other monitoring method;
- II.G.2.b.vi. Records of all inspections meeting the requirements in WAC 173-303-395(1)(d);
- II.G.2.b.vii. Annual reports submitted in compliance with WAC 173-303-220(1), Generator Report – Form 4. However, if the reports are necessary to supplement the facility operating record, they must be retained until final closure is complete and certified.
- II.G.2.b.viii. Annual reports submitted in compliance with WAC 173-303-390(2), TSD Facility Report-Form 5. However, if the reports are necessary to supplement the facility operating record, they must be retained until final closure and corrective action is complete and certified;
- II.G.2.b.ix. Manifests; and
- II.G.2.b.x. Training records of former facility personnel.
- II.G.2.c. Up-to-date copies of the following documents as amended, revised, and modified shall be maintained at the facility until final closure certification is accepted by Ecology:
  - II.G.2.c.i. The Permit and all attachments;
  - II.G.2.c.ii. The Certified RD&D Permit Application dated May 10, 2004;

- II.G.2.c.iii. Documentation of arrangements made with local authorities pursuant to WAC 173-303-340(4) and (5); and
- II.G.2.c.iv. All closure documents prepared pursuant to this Permit [WAC 173-303-610(3)(a)].
- II.G.2.d. For all new tank systems and components, pursuant to WAC 173-303-640(3), an assessment by an independent, registered, professional engineer or by an independent, qualified, installation inspector not affiliated with the tank vendor and certified by an independent, registered, professional engineer, that the tank system was installed properly and that all discrepancies have been repaired as required by WAC 173-303-640(3)(c).
- II.G.2.d.i. Results of periodic tightness testing and integrity assessments of all tank systems; and
- II.G.2.d.ii. For all tanks that require corrosion protection, submit a written statement from an independent corrosion expert that attests to the proper design and installation of any corrosion protection measures.
- II.G.2.e. For all DBVS Facility and DBVS components, pursuant to WAC 173-303-640(3), an assessment by an independent, registered, professional engineer or by an independent, qualified tank installation inspector not affiliated with the tank vendor and certified by an independent, registered, professional engineer, that the tank system was installed properly and that all discrepancies have been repaired as required by WAC 173-303-640(3)(c).

(For purposes of Permit Conditions II.G.2.e.i. and II.G.2.e.ii., where reference is made to WAC 173-303-640, the following substitutions apply: substituting the terms "DBVS" for "tank system(s)," "sub-system(s)" for "tank(s)," "sub-system equipment" for "ancillary equipment," and "sub-system(s) or sub-system equipment of a DBVS" for "component(s)" in accordance with WAC 173-303-680, with the exception that these substitutions do not apply to the subsystems that are marked with an asterisk or an "a" on Permit Tables V.1. and V.4., and do not apply to ICV® Stations listed on Permit Tables V.1. and V.4.

- II.G.2.e.i. Results of periodic tightness testing and integrity assessments of all tank systems; and
- II.G.2.e.ii. For all DBVS subsystems that require corrosion protection, submit a written statement from an independent corrosion expert that attests to the proper design and installation of any corrosion protection measures.

II.H. CLOSURE

- II.H.1. The Permittees must conduct closure of the DBVS Facility and piping leading to the DBVS according to Permit Attachment EE and Condition II.H. The closure plan shall be modified according to provisions of WAC 173-303-610(3)(b)(ii).
- II.H.2. The Permittees shall submit and receive written approval from Ecology, for any update to the Closure Plan, Permit Attachment EE, prior to commencing partial closure.
- II.H.3. The Permittees shall submit and receive written approval from Ecology for a Sampling and Analysis Plan and a revised Closure Plan prior to commencing final closure.
- II.H.4. At least forty-five (45) days before initiating closure, the Permittees must provide Notification of Closure pursuant to WAC 173-303-610(3)(c).
- II.H.5. Ecology may require additional sampling and/or inspection after the Permittees implement the approved Sampling and Analysis Plan if Ecology determines that the sampling and analyses have not adequately demonstrated whether clean closure has been achieved. Such a requirement will be implemented pursuant to WAC 173-303-830(3). Additional sampling and analysis may be required for the following reasons:
- II.H.5.a. Specialized sample collection or analytical techniques are required to ensure adequate quantization limits for chemical constituents; or
- II.H.5.b. Results indicate the need to analyze for additional constituents at certain locations; or
- II.H.5.c. Results indicate additional soil sampling is required in certain locations; or
- II.H.5.d. Other reasons indicate the Sampling and Analysis Plan has not adequately demonstrated whether clean closure has been achieved.
- II.H.6. Documentation supporting the independent registered professional engineer's certification of closure must be submitted to Ecology with the closure certification required by WAC 173-303-610(6). The Permittees are required to furnish documentation supporting the independent registered professional engineer's certification to Ecology upon request, until Ecology has notified the Permittees in writing that Ecology agrees with and has accepted the Permittees' closure certification. The closure documentation must include, at a minimum, the following:
- II.H.6.a. Sampling procedures that were followed;

- II.H.6.b. Soil and concrete locations that were sampled;
- II.H.6.c. Sample labeling and handling procedures that were followed, including chain of custody procedures;
- II.H.6.d. Description of procedures that were followed to decontaminate concrete or metal to meet the clean closure standards as set by Ecology, on a case by case basis, in accordance with the closure performance standards of WAC 173-303-610(2)(a)(ii) and in a manner that minimizes or eliminates post-closure escape of dangerous waste constituents, or to achieve a "clean debris surface" as specified in WAC 173-303-140 [WAC 173-303-610(2)(b)(ii)].
- II.H.6.e. Laboratory and field data, including supporting QA/QC results and requirements;
- II.H.6.f. Report that summarizes closure activities;
- II.H.6.g. Copy of all field notes taken by the independent registered professional engineer; and
- II.H.6.h. Copy of all contamination survey results.
- II.H.7. In addition to other requirements in Permit Attachment EE, the Permittees shall sample and analyze soils at the following locations:
  - II.H.7.a. Where dangerous wastes constituents migrated outside of secondary containment systems as a result of leaks, spills, or other releases of dangerous waste; and
  - II.H.7.b. Where cracks or gaps developed in the concrete of secondary containment systems at any time during the operation of the facility and leaks, spills, or other releases of dangerous waste may have occurred to such cracks or gaps.
- II.H.8. If the value from a soil sample analysis is above the clean closure level for any constituent and represents contamination from the DBVS Facility, then the area represented by the sample (subunit or unit) will be considered to be above the standard for clean closure and the Permittees shall propose additional actions. Ecology will determine whether the additional actions proposed are adequate considering circumstances at the facility. If Ecology determines the actions proposed by the Permittees are not adequate, then Ecology will specify additional actions to be taken. Examples of additional actions may include, but are not limited to, the following:
  - II.H.8.a. Removing or remediating soil that has contamination above the cleanup levels followed by conformational sampling to ensure clean closure standards are met;
  - II.H.8.b. Reanalyzing soils of the entire subunit or unit represented by the sample that has contamination above the cleanup levels using other samples taken within the

subunit or unit and approved statistical methods. Approved statistical methods include, but are not limited to, calculating the upper 95 percent confidence interval about the mean for sample data. If this parameter value for the constituent in question is lower than the Ecology approved numeric cleanup level for clean closure in accordance with WAC 173-303-610(2)(b)(i), then the subunit or unit will be considered to meet the clean closure standards for that constituent. Samples included in this statistical analysis must be randomly selected and the distribution of their concentrations must fit a lognormal or normal distribution;

- II.H.8.c. Establishing post closure care for the areas not able to attain clean closure standards;
- II.H.8.d. Sample labeling and handling including chain of custody procedures;
- II.H.8.e. Decontamination procedures of secondary containment systems; and
- II.H.8.f. Ecology may require modification of the closure plan if significant releases occur at the facility prior to the time of closure.

#### II.H.9. COMPLIANCE SCHEDULE

Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall update and resubmit and receive written approval from Ecology for the Closure Plan, Permit Attachment EE, to be consistent with design details and schedule described in Permit Attachments JJ, KK, and LL. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. The updated Closure Plan, Permit Attachment EE, must be consistent with the closure performance standards specified in WAC 173-303-610(2).

- II.H.10. The following amendment to Permit Attachment EE is hereby made. The Permittee shall submit the revised page reflecting this amendment to Ecology prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility. This amendment does not constitute a permit modification pursuant to Permit Conditions I.C.2. and I.C.3.

Section 11.3, page 11-1, second sentence, is revised as follows: "Closure will require the removal and disposal of all dangerous and/or mixed waste present, removal of contaminated process equipment and contaminated structural components, and removal of all soil contaminated by the DBVS Facility in accordance with WAC 173-303-610(2)(a)."

#### II.I. EQUIVALENT MATERIALS

If certain equipment, materials, and administrative information (such as names, phone numbers, and addresses) are specified in the Permit, the Permittees may use equivalent or superior substitutes. Use of such equivalent or superior items within

the limits (e.g., ranges, tolerances, and alternatives) already clearly specified in sufficient detail in this Permit is not considered a modification of this Permit. However, the Permittees must place documentation of the substitution, accompanied by a narrative explanation and the date the substitution became effective, in the operating record within seven (7) days of putting the substitution into effect, and submit documentation of the substitution to Ecology.

Note: The format of tables and forms contained in Permit Attachment FF are not subject to the requirements of this Permit, and may be revised at the Permittees' discretion.

If Ecology determines that a substitution was not equivalent to the original, they will notify the Permittees that the Permittees' claim of equivalency has been denied, of the reasons for the denial, and that the original material or equipment must be used.

## **II.J. CLEANUP OF RELEASED MATERIAL**

II.J.1. The Permittees shall comply with the requirements of WAC 173-303-145, including but not limited to, notification, mitigation, and control measures specified in WAC 173-303-145(2) and (3) under the following circumstances:

II.J.1.a. A spill or non-permitted discharge of dangerous and/or mixed waste or hazardous substance that is intentionally or accidentally spilled or discharged into the environment (unless otherwise permitted) such that human health or the environment is threatened, regardless of the quantity of dangerous and/or mixed waste or hazardous substance. For spills or discharges onto the ground, into the groundwater, or into the surface water notify all local authorities in accordance with the local emergency plan.

II.J.1.b. A spill or non-permitted discharge of dangerous or mixed waste or hazardous substance results in emission into the air such that human health or the environment is threatened.

II.J.1.c. Other spills or discharges occur which threaten human health or the environment.

II.J.2. Consistent with good management for abatement of initiating cause and prudent consideration of health and safety risks to personnel, the Permittees shall remove spilled or leaked waste within secondary containment within twenty-four (24) hours, or in as timely a manner as is possible, to prevent harm to human health and the environment.

## **II.K. FINANCIAL ASSURANCE AND LIABILITY REQUIREMENTS**

II.K.1. The Permittees are subject to the cost estimate requirements for facility closure in accordance with WAC 173-303-620(3) and the cost estimate requirements for post-

closure monitoring and maintenance as in WAC 173-303-620(5). The Permittees are exempt from the liability requirements in WAC 173-303-620(8) and the financial assurance requirements in WAC 173-303-620(4).

**II.L. LAND DISPOSAL RESTRICTIONS**

**II.L.1.** The Permittee shall comply with all Land Disposal Restriction requirements as set forth in WAC 173-303-140 and Permit Attachment AA.

**II.M. AIR EMISSIONS**

**II.M.1.** Prior to installing or using any equipment subject to the requirements of WAC 173-303-690, the Permittees shall obtain a permit modification following the Permit Conditions I.C.2. and I.C.3. process to incorporate WAC 173-303-690 standards into the Permit Application and this Permit prior to generation/receipt of dangerous and/or mixed waste in the DBVS Facility.

**II.M.2.** Prior to installing or using any equipment subject to the requirements of WAC 173-303-691, the Permittees shall obtain a permit modification following the Permit Condition I.C.2. and I.C.3. process to incorporate WAC 173-303-691 standards into the Permit Application and this Permit prior to generation/receipt of dangerous and/or mixed waste in the DBVS Facility.

**PART III - CONTAINERS**

For purposes of Permit Part III, all references to Permit Attachment JJ shall be read as references to Permit Attachment JJ, as revised pursuant to Permit Condition III.G.

**III.A. CONTAINER MANAGEMENT AREAS AND ACCUMULATION LIMITS**

**III.A.1.** The Permittees shall place or store dangerous and/or mixed waste ICV® Packages in the areas identified in Figure 2-3 of Permit Attachment JJ and Permit Table III.1.

**III.A.2.** Any dangerous and/or mixed waste generated and managed in containers by the facility shall be managed in accordance with the generator requirements in WAC 173-303-200.

**III.A.3.** For the purpose of determining compliance with storage capacity limits, every ICV® Package shall be considered to be full.

**III.A.4.** The Permittees may store dangerous and/or mixed waste ICV® Packages with the waste codes listed in Table 6-1, excluding characteristic code D001 and D003 of Permit Attachment BB, in accordance with Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8. Total containerized dangerous

and/or mixed waste storage at the DBVS Facility shall not exceed capacity specified on Permit Table III.1.

- III.A.5. The Permittees may place and store dangerous and/or mixed waste only in approved container storage areas listed in Permit Table III.1. The Permittees shall limit the total volume of waste to quantities specified for the individual container storage areas listed in Permit Table III.1.
- III.A.6. The Permittees are not authorized to store free liquids in any of the approved container storage areas listed in Permit Table III.1.
- III.A.7. The Permittees shall maintain documentation in the operating record for each container storage area listed in Permit Table III.1. in accordance with WAC 173-303-380 and 173-303-210.

III.B. CONTAINER STORAGE AREAS DESIGN AND CONSTRUCTION

- III.B.1. The Permittees shall construct container storage areas identified in Permit Table III.1., as specified in all applicable drawings and specifications in Permit Attachment JJ and Permit Part III.
- III.B.2. All container storage areas identified in Permit Table III.1., must be constructed in accordance with WAC 173-303-630(7)(c).

III.C. CONTAINER MANAGEMENT PRACTICES

- III.C.1. No dangerous and/or mixed waste shall be managed in the container storage areas unless the operating conditions specified under Permit Condition III.C. are complied with.
- III.C.2. The Permittees shall manage all containerized dangerous and/or mixed waste for container storage areas identified in Permit Table III.1., in accordance with procedures described in Permit Attachment JJ and the following conditions:
  - III.C.2.i. The operating records and waste tracking procedures shall indicate all times at which containerized dangerous and/or mixed waste were placed, removed from, and returned to designated storage areas as approved pursuant to Permit Conditions III.F. and II.G., Recordkeeping [WAC 173-303-380];
  - III.C.2.ii. The physical arrangement (i.e., spacing) of dangerous and/or mixed waste containers shall be in compliance with WAC 173-303-630(5)(c) as specified in Figure 2-2 of Permit Attachment JJ;
  - III.C.2.iii. All container storage areas must be operated in accordance with WAC 173-303-630;

- III.C.2.iv. The Permittee shall not place and store ignitable and/or reactive dangerous and/or mixed waste in the container storage areas specified in Permit Table III.1. [WAC 173-303-630 (8)];
- III.C.2.v. At all times, the Permittees shall not place and store incompatible dangerous and/or mixed waste, or dangerous and/or mixed waste and materials, in the container storage areas specified in Permit Table III.1. [WAC 173-303-630 (9)(a)];
- III.C.2.vi. At all times, containers holding dangerous and/or mixed waste in container storage areas must be closed, except when it is necessary to add or remove waste [WAC 173-303-630(5)(a)];
- III.C.2.vii. At all times, containers holding dangerous and/or mixed waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak [WAC 173-303-630(5)(b)];
- III.C.2.viii. If a container holding dangerous and/or mixed waste is not in good condition (e.g., exhibits severe rusting, apparent structural defects, or any other condition that could lead to container rupture or leakage) or is leaking, the Permittees shall manage the container in accordance with procedures described in Permit Attachment JJ [WAC 173-303-630(2)];
- III.C.2.ix. The Permittees shall ensure that all containers used for dangerous and/or mixed waste management, are made of or lined with materials which will not react with, and are otherwise compatible with, the waste to be stored [WAC 173-303-630(4)]; and
- III.C.2.x. The Permittees shall not place incompatible dangerous and/or mixed wastes, or incompatible dangerous and/or mixed wastes and materials, in the same container unless WAC 173-303-395(1)(b) is complied with [WAC 173-303-630(9)(a)].

III.D. IDENTIFICATION OF CONTAINERS AND CONTAINER STORAGE AREAS

- III.D.1. Pursuant to WAC 173-303-630(3), the Permittees shall ensure that all dangerous and/or mixed waste containers are labeled in a manner that adequately identifies the major risk(s) associated with the contents.
- III.D.2. For all dangerous and/or mixed waste containers, the Permittees shall ensure that:
  - III.D.2.i. Labels are not obscured or otherwise unreadable;
  - III.D.2.ii. Waste containers are oriented so as to allow inspection of the labels identified in Permit Conditions III.D.1. and III.D.2., the container tracking number, and, to the extent possible, any labels which the generator placed upon the container; and

III.D.2.iii. Empty dangerous and/or mixed waste containers, as defined by WAC 173-303-160(2), must have their dangerous and/or mixed waste labels destroyed, or otherwise removed, immediately upon being rendered empty.

III.D.3. The Permittees shall post entrances and access points to container storage areas specified in Permit Table III.1. with signs that meet the requirements of WAC 173-303-310(2)(a).

III.E. INSPECTIONS AND RECORDKEEPING

III.E.1. The Permittees shall ensure all containment areas are inspected and maintained such that they are free of cracks, gaps, and are impervious to leaks, spills, and accumulation of rainfall until the collected material is removed. The Permittees shall inspect the container storage areas in accordance with the Inspection Schedules in Permit Attachment II, as revised pursuant to Permit Condition II.D.2.

III.E.2. For the container storage areas, the Permittees shall record and maintain in the DBVS Facility operating record, all monitoring, recording, maintenance, calibration, test data, and inspection data compiled under the conditions of this Permit, in accordance with Permit Condition II.G.

III.F. CLOSURE

III.F.1. The Permittees shall close the DBVS Facility container storage areas in accordance with Permit Condition II.H. as revised pursuant to Permit Condition II.H.9.

III.G. COMPLIANCE SCHEDULES

III.G.1. All information identified for submittal to Ecology in Permit Conditions III.G.2. through III.G.4. of this compliance schedule must be signed and certified in accordance with the requirements in WAC 173-303-810(12) and (13).

III.G.2. Prior to construction of the DBVS Facility container storage area, as identified in Permit Table III.1., the Permittees shall submit and receive written approval from Ecology for engineering information as specified below, for incorporation into Permit Attachment JJ. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:

III.G.2.a. Design drawings (General Arrangement Drawings - in plan and cross sections) and specifications including references to specific codes and standards (e.g., UBC, ASCE, etc.) for each container storage areas' foundation. These items should show basic design parameters and dimensions, and location of the container storage areas, to keep containers from contact with standing liquids (i.e., elevated or are otherwise protected).

- III.G.3. Prior to initial receipt of dangerous and/or mixed waste to the DBVS Facility, the Permittees shall submit and receive written approval from Ecology for Permit Table III.1. updated to include the contents of Column 2 "Engineering Description" to reflect the engineering information provided under III.G.2.a. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.
- III.G.4. Prior to initial receipt of dangerous and/or mixed waste to the DBVS Facility, the Permittees shall update and submit and receive written approval from Ecology for the following, as specified below, for incorporation into Permit Attachment JJ. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:
- III.G.4.a. Narrative Descriptions, updated;
- III.G.4.b. Descriptions of procedures for precluding release of contents of ICV® Package to the environment during the ICV® Package disconnect and sampling the ICV® Package including, but not limited, to the following:
- III.G.4.b.i. Sealing the sampling port;
- III.G.4.b.ii. Coring process;
- III.G.4.b.iii. External decontamination; and
- III.G.4.b.iv. ICV® Package disconnect procedures;
- III.G.4.c. Descriptions of procedures for handling and transport of containers within the DVBS Facility;
- III.G.4.d. Description of the tracking system used to track containers throughout the DBVS Facility pursuant to WAC 173-303-380. The tracking system, at a minimum, will do the following:
- III.G.4.d.i. Track the location of containers within the DBVS Facility;
- III.G.4.d.ii. Track which containers have been shipped off-facility and/or off-site, and to where they have been shipped, as appropriate;
- III.G.4.d.iii. For containers intended for transport off-site, include information in accordance with the requirements specified in WAC 173-303-190(3)(b);
- III.G.4.d.iv. Record the date container is placed in the container storage area;
- III.G.4.d.v. Record the nature of the waste in any given container, including dangerous waste designation codes, any associated Land Disposal Restriction treatment

requirements, and the major risk(s) associated with the waste as described in Permit Condition III.D.;

- III.G.4.e. The Description(s) of procedures for container spacing, stacking, and labeling pursuant to WAC 173-303-630(3), WAC 173-303-630(5)(c), and WAC 173-303-340(3);
- III.G.4.f. The Description(s) of procedures for inspecting the container storage areas [WAC 173-303-320 and WAC 173-303-630(6)]; and
- III.G.4.g. The Description(s) of procedures for responding to damaged (e.g., severe rusting, apparent structural defects) or leaking containers [WAC 173-303-630(2)].

**TABLE III.1. – DESCRIPTION OF DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) FACILITY CONTAINER STORAGE AREAS**

<b>Dangerous Waste and Mixed Waste Container Storage Areas</b>	<b>Maximum Capacity Solids</b>	<b>Engineering Description (Drawing No., Specification No., etc.)</b>	<b>Narrative Description, Tables &amp; Figures</b>
ICV® Package Storage Area	2,718 m <sup>3</sup> (96,000 ft <sup>3</sup> )	RESERVED	Sections 2.3.2, 2.4, 4.2.9, 4.2.1.0, 4.2.11, 7.2.4, and 7.4 Figures 2-2, B-1, B-4, and 7-1
ICV® Package Sampling Area	54.4 m <sup>3</sup> (1,920 ft <sup>3</sup> )	RESERVED	Sections 2.4, 7.2.4, and 7.4. Figures 2-2, B-1, B-4, and 7-1
ICV® Package Preparation	54.4 m <sup>3</sup> (1,920 ft <sup>3</sup> )	RESERVED	Sections 2.4, 7.2.4, and 7.4. Figures 2-2, B-1, B-4, and 7-1

Dangerous Waste and Mixed Waste Container Storage Areas	Maximum Capacity Solids	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables & Figures
ICV® Package Cooling Area	54.4 m <sup>3</sup> (1,920 ft <sup>3</sup> )	RESERVED	Sections 2.4, 7.2.4, and 7.4. Figures 2-2, B-1, B-4, and 7-1

#### **PART IV – TANKS**

##### **IV.A. TANK SYSTEMS**

For purposes of Permit Part IV, all references to Permit Attachment KK shall be read as references to Permit Attachment KK, as revised pursuant to Permit Condition IV.A.8.

##### **IV.A.1. Approved Waste and Storage Limits**

- IV.A.1.a. The Permittees may store in tank systems all dangerous and/or mixed waste with the waste codes listed in Table 6-1 and described in Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8. (mixed waste retrieved from Tank 241-S-109 and Simulant Dangerous Waste) and as specified in Permit Conditions II.A.1. and II.A.2. excluding characteristic codes D001 and D003.
- IV.A.1.b. The Permittees may store and manage dangerous and/or mixed waste only in approved tank systems listed in Permit Table IV.1. and as specified in Permit Attachment KK. The Permittees shall limit the total volume of waste to quantities specified for the individual units listed in Permit Table IV.1.
- IV.A.1.c. The Permittees shall manage dangerous and/or mixed waste in any DBVS Facility tank system specified in Permit Attachment KK and Permit Table IV.1., with the waste codes listed in Table 6-1 of Permit Attachment BB, in accordance with Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8., excluding characteristic codes D001 and D003.
- IV.A.1.d. The Permittees shall ensure all certifications required by independent specialists (e.g., IQRPE, independent corrosion expert, independent qualified installation inspector, etc.) use the certification statement listed in WAC 173-303-810(13).

- IV.A.1.e. In all future permit submittals, the Permittees shall include tank names with the tank designation (e.g., Tri-Mer Effluent tanks located in the offgas treatment system are designated 37-D74-013).
- IV.A.2. Tank System Design and Construction
- IV.A.2.a. The Permittees shall construct the DBVS Facility tank systems, as listed in Permit Table IV.1., in accordance with Permit Attachment KK and Permit Part IV.
- IV.A.3. Tank System Installation and Certification for Aboveground Tank Systems
- IV.A.3.a. The use of new aboveground tanks will require certification by an IQRPE that the tank(s) system has sufficient structural integrity and is acceptable for the storing and treatment of dangerous and/or mixed waste in accordance with WAC 173-303-640(3)(a).
- IV.A.3.b. Used aboveground tanks must be certified sound by an IQRPE in accordance with WAC 173-303-640(2)(c).
- IV.A.3.c. The Permittees must ensure that proper handling procedures are adhered to in order to prevent damage to the DBVS Facility tank system during installation. An independent, qualified installation inspector or an IQRPE, trained and experienced in the proper installation of tank systems or components, must inspect the system for the presence of any weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, other structural damage, or inadequate construction/installations.
- All discrepancies must be remedied before the DBVS Facility tank system is enclosed or placed into use [WAC 173-303-640(3)(c)].
- IV.A.3.d. The Permittees must test for tightness all new tanks and ancillary equipment prior to these components being placed into use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being enclosed or placed into use [WAC 173-303-640(3)(e)].
- IV.A.3.e. The Permittees must ensure ancillary equipment is supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction [WAC 173-303-640(3)(f)].
- IV.A.3.f. Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility, the Permittees shall obtain, and keep on file in the operating record, written statements by those persons required to certify the design of the DBVS Facility tank system and supervise the installation of the tank system in accordance with the requirements of WAC 173-303-640(3)(c), (e), and (f), attesting that each DBVS Facility tank system and corresponding containment system listed in Permit Table IV.2. and Permit Attachment KK, was properly designed and installed, and that

repairs pursuant to WAC 173-303-640(3)(c) and (e) were performed [WAC 173-303-640(3)(a) and WAC 173-303-640(3)(h)].

- IV.A.3.g. The independent tank system installation inspection and subsequent written statements shall be certified pursuant to IV.A.1.d., comply with all requirements of WAC 173-303-640(3)(h), and shall consider, but not be limited to, the following tank system installation documentation:
  - IV.A.3.g.i. Field installation report with date of installation;
  - IV.A.3.g.ii. Approved welding procedures;
  - IV.A.3.g.iii. Welder qualifications and certifications;
  - IV.A.3.g.iv. Hydro-test reports, as applicable, in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 1, American Petroleum Institute (API) Standard 620, or Standard 650, as applicable;
  - IV.A.3.g.v. Tester credentials;
  - IV.A.3.g.vi. Field inspector credentials;
  - IV.A.3.g.vii. Field inspector reports;
  - IV.A.3.g.viii. Field waiver reports; and
  - IV.A.3.g.ix. Non-compliance reports and corrective action (including field waiver reports) and repair reports.
- IV.A.3.h. The Permittees shall ensure periodic integrity assessments are conducted on the DBVS Facility tank systems listed in Permit Table IV.1., over the term of this Permit as specified in WAC 173-303-640(3)(b), following the description of the integrity assessment program Permit Attachment II, as revised pursuant to Permit Condition II.D.2.
- IV.A.3.i. The Permittees shall address problems detected during the DBVS Facility tank system integrity assessments specified in Permit Condition IV.A.3.i., following the integrity assessment program in Permit Attachment II, as revised pursuant to Permit Condition II.D.2.
- IV.A.3.j. The Permittees must immediately and safely remove from service any DBVS Facility tank system or secondary containment system which through an integrity assessment is found to be "unfit for use" as defined in WAC 173-303-040, following Permit Condition IV.A.4.h.v. The affected tank system or secondary containment system must be either repaired or closed in accordance with Permit Condition IV.A.4.h.v. [WAC 173-303-640(7)(e) and (f) and WAC 173-303-640(8)].

- IV.A.3.k. The Permittees must provide the type and degree of corrosion protection recommended by an independent corrosion expert, based on the information provided in Permit Attachments BB, as revised pursuant to Permit Conditions II.B.7. and II.B.8., and Permit Attachments FF and KK, as revised pursuant to Permit Condition IV.A.8., or other corrosion protection if Ecology believes other corrosion protection is necessary to ensure the integrity of the tank system during its use. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation [WAC 173-303-640(3)(g)].
- IV.A.4. Tank Management Practices
- IV.A.4.a. No dangerous and/or mixed waste shall be managed in the DBVS Facility tank systems unless the operating conditions specified under Permit Condition IV.A.4. and Permit Attachment KK are complied with.
- IV.A.4.b. The Permittees shall install and test all process and leak detection system monitoring/instrumentation as specified in Permit Table IV.3. and Permit Attachment KK.
- IV.A.4.c. The Permittees shall not place mixed waste, treatment reagents, or other materials in the DBVS Facility tank systems if these substances could cause the DBVS Facility tank systems to rupture, leak, corrode, or otherwise fail [WAC 173-303-640(5)(a)].
- IV.A.4.d. The Permittees shall operate the DBVS Facility tank systems to prevent spills and overflows using the description of controls and practices as required in WAC 173-303-640(5)(b).
- IV.A.4.e. The Permittees shall mark all these tank systems holding dangerous and/or mixed waste with labels or signs to identify the waste contained in the tank. The labels, or signs, must be legible at a distance of at least fifty (50) feet and must bear a legend that identifies the waste in a manner which adequately warns employees, emergency response personnel, and the public of the major risk(s) associated with the waste being stored or treated in the tank system(s) [WAC 173-303-640(5)(d)].
- IV.A.4.f. The Permittees shall ensure that the secondary containment systems for the DBVS Facility tank systems listed in Permit Table IV.1. and Permit Attachment KK are free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, groundwater, or surface water at any time that waste is in the tank system. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired [WAC 173-303-320, WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6)].

- IV.A.4.g. An impermeable interior coating or lining shall be maintained for all concrete containment systems and concrete portion of containment systems. Concrete containment systems that have construction joints must meet the requirements of WAC 173-303-640(4)(e)(ii)(C). The coating shall prevent migration of any dangerous and/or mixed waste into the concrete. All coatings shall meet the following performance standards:
- IV.A.4.g.i. The coating must seal the containment surface such that no cracks, seams, or other avenues through which liquid could migrate are present;
- IV.A.4.g.ii. The coating must be of adequate thickness and strength to withstand the normal operation of equipment and personnel within the given area such that degradation or physical damage to the coating or lining can be identified and remedied before dangerous and/or mixed waste could migrate from the system; and
- I.V.A.4.g.iii. The coating must be compatible with the dangerous and/or mixed waste, treatment reagents, or other materials managed in the containment system [WAC 173-303-640(4)(e)(ii)(D)].
- IV.A.4.h. The Permittees shall inspect all secondary containment systems for the DBVS Facility tank systems in accordance with the Inspection Schedule specified in Permit Attachment II, as revised pursuant to Permit Condition I.D.2., and take the following actions if a leak or spill of dangerous and/or mixed waste is detected in these containment systems [WAC 173-303-320, WAC 173-303-640(5)(c), and WAC 173-303-640(6)]:
- IV.A.4.h.i. Immediately and safely stop the flow of dangerous and/or mixed waste into the DBVS Facility tank system or secondary containment system, in accordance with procedures based on all applicable safety analysis documentation [WAC 173-303-640(7)(a)];
- IV.A.4.h.ii. Determine the source of the dangerous and/or mixed waste;
- IV.A.4.h.iii. Remove the waste from the secondary containment area pursuant to WAC 173-303-640(7)(b). The waste removed from the containment areas of the DBVS Facility tank system shall be managed as dangerous and/or mixed waste;
- IV.A.4.h.iv. If the cause of the release was a spill that has not damaged the integrity of the DBVS Facility tank system, the Permittees may return the tank system to service pursuant to WAC 173-303-640(7)(e)(ii). In such a case, the Permittees shall take action to ensure the incident that caused liquid to enter the containment systems of these tank systems will not reoccur [WAC 173-303-320(3)];
- IV.A.4.h.v. If the source of the dangerous and/or mixed waste is determined to be a leak from a DBVS Facility primary tank system or the system is unfit for use as determined through an integrity assessment or other inspection, the Permittees must comply

with the requirements of WAC 173-303-640(7) and close the DBVS Facility tank system according to procedures in WAC 173-303-640(7)(e)(i) through (iv) or repair and re-certify the DBVS Facility tank system in accordance with WAC 173-303-810(13)(a) before the tank system is placed back into service [WAC 173-303-640(7)(e) and (f)];

IV.A.4.h.vi. The Permittees shall document in the operating record actions/procedures taken to comply with i. through v. above in accordance with WAC 173-303-640(6)(d); and

IV.A.4.h.vii. The Permittees shall notify and report releases to the environment to Ecology in accordance with WAC 173-303-640(7)(d).

IV.A.4.i. If liquids (e.g., dangerous and/or mixed waste leaks and spills, precipitation, fire water liquids from damaged or broken pipes) cannot be removed from the DBVS Facility tank systems secondary containment system within twenty-four (24) hours, Ecology will be verbally notified within twenty-four (24) hours of discovery. The notification shall provide the information in i., ii., and iii. listed below. The Permittees shall provide Ecology with a written demonstration within seven (7) business days, identifying at a minimum [WAC 173-303-640(4)(c) and WAC 173-303-640(7)(b)(ii)]:

IV.A.4.i.i. The reasons for delayed removal;

IV.A.4.i.ii. The measures implemented to ensure continued protection of human health and the environment; and

IV.A.4.i.iii. The current actions being taken to remove liquids from secondary containment.

IV.A.5. Inspections [WAC 173-303-640(6)]

IV.A.5.a. The Permittees shall inspect the DBVS Facility tank systems in accordance with the Inspection Schedules in Permit Attachment II, as revised pursuant to Permit Condition II.D.2.

IV.A.5.b. The inspection data for the DBVS Facility tank systems shall be recorded, and the records shall be placed in the DBVS Facility tank systems operating record as specified in accordance with Permit Condition II.G.

IV.A.6. Recordkeeping [WAC 173-303-380]

For the DBVS Facility tank systems, the Permittees shall record and maintain in the operating record, all monitoring, calibration, recording, maintenance, test data, and inspection data compiled under the conditions of this Permit in accordance with Permit Attachment KK, Permit Table IV.3., and Permit Conditions II.G. and II.C.

IV.A.7. Closure

The Permittees shall close the DBVS Facility tank systems in accordance with Permit Condition II.H., as revised pursuant to Permit Condition II.H.9.

IV.A.8. COMPLIANCE SCHEDULE

IV.A.8.a. All information identified for submittal to Ecology in IV.A.8.b. through IV.A.8.e. of this compliance schedule must be signed and certified in accordance with requirements in WAC 173-303-810(12) and (13).

IV.A.8.b. Prior to construction of each DBVS Facility tank system, excluding ancillary equipment addressed in Permit Condition IV.A.8.c., as identified in Permit Table IV.1., the Permittees shall submit and receive approval from Ecology for the engineering information as specified below, for incorporation into Permit Attachment KK. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. At a minimum, engineering information specified below will show the following as required pursuant to WAC-173-303-640 (the information specified below will include dimensioned engineering drawings and information on sumps and floor drains):

IV.A.8.b.i. IQRPE Reports for each DBVS Facility tank system, excluding ancillary equipment addressed in Permit Condition IV.A.8.c., shall include review of design drawings, calculations, and other information on which the certification report is based and shall include as applicable, but not limited to, review of such information described below. IQRPE Reports shall be consistent with the information separately provided in ii. through viii. below [WAC-173-303-640(3)(a)];

IV.A.8.b.ii. Design Drawings, including references to codes and standards (general arrangement drawings in plan and cross section), updated Appendix B of Permit Attachment KK process flow diagrams, specifications, piping and instrument diagrams (including pressure control systems, instrumentation/control loops and liner installation details), and leak detection methodology. These items should show the dimensions, volume calculations, and location of the secondary containment system, and should include items such as floor/pipe slopes to sumps, tanks, floor drains, location, and physical attributes of each tank [WAC 173-303-640(4)(b) through (f) and WAC 173-303-640(3)(a)];

IV.A.8.b.iii. A description of materials and equipment used to provide corrosion protection for external metal components in contact with soil, including factors affecting the potential for corrosion as required under WAC 173-303-640(3)(a)(iii)(B) [WAC 173-303-806(4)(c)(v)];

IV.A.8.b.iv. Detailed description of how the secondary containment for each DBVS Facility tank system will be installed in compliance with WAC 173-303-640(3)(c);

- IV.A.8.b.v. Tank, secondary containment/foundation, and leak detection system materials selection documentation (including, but not limited to, concrete coatings and water stops, and liner materials as applicable) (e.g., physical and chemical tolerances) [WAC 173-303-640(3)(a) and WAC 173-303-806(4)(c)(i)];
- IV.A.8.b.vi. Tank vendor information (including, but not limited to, required performance warranties, as available) consistent with information submitted under ii. above [WAC 173-303-640(3)(a)];
- IV.A.8.b.vii. Detailed description of how the tanks will be installed in compliance with WAC 173-303-640(3)(c), (d), and (e); and
- IV.A.8.b.viii. Tanks designed to prevent the escape of vapors, fumes, and emissions of acutely or chronically toxic (upon inhalation) extremely hazardous waste (EHW), and to prevent the buildup of explosive gases/vapors [WAC 173-303-640(5)(e)].
- IV.A.8.c. Prior to installation of ancillary equipment that is used to distribute, meter, or control the flow of dangerous and/or mixed waste from its point of generation to a storage or treatment tank(s), between dangerous and/or mixed waste storage and treatment tanks to a point of disposal on-site, or to a point of shipment for disposal off-site for each DBVS Facility tank system, as identified in Permit Table IV.1., the Permittees shall submit and receive approval from Ecology for the engineering information as specified below, for incorporation into Permit Attachment KK (the information specified below will include dimensioned engineering drawings). Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:
- IV.A.8.c.i. IQRPE Reports verifying that the ancillary equipment has sufficient structural integrity and is acceptable for the storing and treating of dangerous waste and/or mixed waste, shall include a review of design drawings, calculations, and other information as applicable, on which the certification report is based and shall include as applicable, but not be limited to, review of such information described below. The IQRPE Reports shall be consistent with the information provided separately in ii. through v. below, and the IQRPE Reports specified in Permit Condition IV.A.8.b. [WAC 173-303-640(3)(a)];
- IV.A.8.c.ii. Design drawings (Process Flow Diagrams, Piping and Instrumentation Diagrams [including pressure control systems], etc.), updated Appendix B of Permit Attachment KK, projected performance standards, and other information specific to ancillary equipment (these drawings should include all equipment such as pipe, valves, fittings, pumps, instruments, etc.) [WAC 173-303-640(3)(a)];
- IV.A.8.c.iii. Design criteria (references to codes and standards, load definitions, and load combinations, materials of construction, and analysis/design methodology) and typical design details for the support of the ancillary equipment [WAC 173-303-640(3)(a) and WAC 173-303-640(3)(f)];

- IV.A.8.c.iv. A detailed description of how the ancillary equipment will be installed and tested in compliance with WAC 173-303-640(3)(c) through (e) and WAC 173-303-640(4)(b) and (c); and
- IV.A.8.c.v. Ancillary equipment designed to prevent the escape of vapors, fumes, and emissions of acutely or chronically toxic (upon inhalation) EHW, and to prevent the buildup of explosive gases/vapors [WAC 173-303-640(5)(e)].
- IV.A.8.d. Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility tank systems, the Permittees shall submit and receive Ecology approval of the following as specified below for incorporation into Permit Attachment KK. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions IV.A.8.b. and c. as approved by Ecology. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.
- IV.A.8.d.i. Integrity assessment program and schedule for all DBVS Facility tank systems shall address the conducting of periodic integrity assessments on all DBVS Facility tank systems over the life of the tank, in accordance with Permit Conditions IV.A.3.i., IV.A.3.j., IV.A.3.k., and Permit Attachment II, as revised pursuant to Permit Condition II.D.2. and WAC 173-303-640(3)(b) and descriptions of procedures for addressing problems detected during integrity assessments. The schedule must be based on past integrity assessments, age of the tank system, materials of construction, characteristics of the waste, and any other relevant factors [WAC 173-303-640(3)(b)];
- IV.A.8.d.ii. Detailed plans and descriptions, demonstrating the leak detection system is operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of dangerous and/or mixed waste, or accumulated liquid in the secondary containment system within twenty-four (24) hours [WAC 173-303-640(7)(b)(i)]. Detection of a leak of at least 0.1 gallons per hour within twenty-four (24) hours is defined as being able to detect a leak within twenty-four (24) hours. Any exceptions to this criteria must be approved by Ecology in accordance with WAC 173-303-640(4)(c)(iii) and WAC 173-303-806(4)(viii);
- IV.A.8.d.iii. Detailed operational plans and descriptions, demonstrating that spilled or leaked waste and accumulated liquids can be removed from the secondary containment system within twenty-four (24) hours [WAC 173-303-806(4)(c)(vii)];
- IV.A.8.d.iv. Descriptions of operational procedures demonstrating appropriate controls and practices are in place to prevent spills and overflows from the DBVS Facility tanks or containment systems in compliance with WAC 173-303-640(5)(b)(i) through (iii) and WAC 173-303-806(4)(viii);

- IV.A.8.d.v. Description of procedures for investigation and repair of the DBVS Facility tank systems [WAC 173-303-320, WAC 173-303-640(6), WAC 173-303-640(7)(e) and (f), WAC 173-303-806(4)(a)(v), and WAC 173-303-806(4)(viii)];
- IV.A.8.d.vi. The Permittees will provide a description of procedures for management of dangerous and/or mixed waste as specified in WAC 173-303-640(9) and (10) with the waste codes listed in Table 6-1, excluding D002 of Permit Attachment BB, in accordance with Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8.; and
- IV.A.8.d.vii. A description of the tracking system used to track dangerous and/or mixed waste throughout the DBVS Facility tank system, pursuant to WAC 173-303-380.
- IV.A.8.e. Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility tank systems, the Permittees shall submit and receive Ecology approval of the following, as specified below, for incorporation into this Permit. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions IV.A.8.b. through d.
- IV.A.8.e.i. Permit Table IV.1. amended as follows:
- A. Under column 1, update and complete list of dangerous and/or mixed waste DBVS Facility tank systems.
  - B. Under column 2, update and complete system designations.
  - C. Under column 3, replace the 'Reserved' with the appropriate references (e.g., drawing numbers, etc.) to the updated portions of Permit Attachment KK.
  - D. Under column 4, update and complete list of narrative description, tables, and figures.
  - E. Under column 5, update and replace the "Reserved" with the appropriate capacity.
- IV.A.8.e.ii. Permit Table IV.2., complete to provide for all secondary containment sumps and floor drains, the information as specified in each column heading.
- IV.A.8.e.iii. Permit Table IV.3., shall be completed for the DBVS Facility tank system leak detection system instruments and parameters to provide the information as specified in each column heading.
- IV.A.8.f. The following amendments to Permit Attachment KK are hereby made. The Permittees shall submit the revised pages reflecting these amendments to Ecology prior to installation of the DBVS tank system as identified in Permit Table IV.1.

These amendments do not constitute a permit modification pursuant to Permit Conditions I.C.2. and I.C.3.:

- IV.A.8.f.i. Figure B-4, revised to include two (2) additional Waste and Simulant Staging Tanks, consistent with Permit Table IV.1., the first numbered 32-D74-016 and the second to be numbered.
- IV.A.8.f.ii. Figure B-6, revised to include four additional Tri-Mer Effluent Tanks, consistent with Permit Table IV.1.
- IV.A.8.f.iii. Figure B-4, revised to include one additional Tri-Mer Bleed Sump Tank, consistent with Permit Table IV.1.

**TABLE IV.1. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS)  
FACILITY TANK SYSTEMS DESCRIPTION**

<b>Dangerous and/or Mixed Waste Tank Systems Name</b>	<b>System Designation and Equipment Number</b>	<b>Engineering Description (Drawing No., Specification No., etc.)<sup>b</sup></b>	<b>Narrative Description, Table &amp; Figures</b>	<b>Maximum Capacity (gallons)</b>
Waste and Simulant Staging Tank	WRS-Tanks RESERVED	RESERVED	Sections 2.3.2 and 4.2.3; Table 2-1; Figures 2-3, 2-4, and Figure B-7	1,000
Waste and Simulant Staging Tanks	DBVS-Tanks	RESERVED	Sections 2.3.2 and 4.2.2.2; Table 2-1; Figures 2-2 and B-1	
#1	32-D74-002			18,000
#2	32-D74-003			18,000
#3	32-D74-016			18,000
#4	RESERVED			18,000
Receiver Tank From Bottom of Dryer	DBVS-Tanks	RESERVED	RESERVED	RESERVED
Dry Waste Silos (Hoppers)	DBVS-Tanks	RESERVED	Sections 2.3.3 and 4.2.8 and Figure B-1	
#1	34-D002-007			140 cubic feet
#2	34-D002-008			140 cubic feet

<b>Dangerous and/or Mixed Waste Tank Systems Name</b>	<b>System Designation and Equipment Number</b>	<b>Engineering Description (Drawing No., Specification No., etc.)<sup>b</sup></b>	<b>Narrative Description, Table &amp; Figures</b>	<b>Maximum Capacity (gallons)</b>
Dryer Condensate Tanks	DBVS-Tanks 37-D74-009 37-D74-010	RESERVED	Sections 2.6 and 4.3.2; Table 4-5; Figures 2-2, B-1, and B-4	Dryer Condensate: 18,000 18,000
Dryer Offgas Condensate Tank	DBVS-Tanks 33-D74-015	RESERVED	Figure B-1 and B-4	500
Venturi Scrubber System (VSS) #1	DBVS Tank 36-D74-052	RESERVED	Sections 2 and 4; Figures B-2 and B-5	690
#2	36-D74-054			690
Venturi Scrubber System (VSS) Bleed Tanks #1	DBVS -Tanks 37-D74-011	RESERVED	Section 4.2.15; Figures 2-2, B-2, and B-5	18,000
#2	37-D74-012			18,000
Tri-Mer Effluent #1	DBVS -Tanks 37-D74-013	RESERVED	Sections 2.6 and 4.2.15; Figures 2-2, B-3, and B-6	18,000
#2	37-D74-014			18,000
#3	RESERVED			18,000
#4	RESERVED			18,000
#5	RESERVED			18,000
#6	RESERVED			18,000
NH3 Scrubber Effluent/Bleed Tank	DBVS-Tank RESERVED	RESERVED	Figure B-3	2,000
Tri-Mer Bleed Sump Tank	RESERVED	RESERVED	RESERVED	RESERVED

**TABLE IV.2. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS)  
FACILITY TANK SYSTEMS SECONDARY CONTAINMENT SYSTEMS  
INCLUDING SUMPS AND FLOOR DRAINS**

Sump/Floor Drain I.D. No. & Room Location	Maximum Sump Capacity (gallons)	Sump Dimensions (feet) & Materials of Construction	Engineering Description (Drawing No., Specification No., etc.)
RESERVED	RESERVED	RESERVED	RESERVED

**TABLE IV.3. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS)  
FACILITY TANK SYSTEMS PROCESS AND LEAK DETECTION SYSTEM  
INSTRUMENTS AND PARAMETERS**

Sub-system Locator and Name (including P&ID)	Control Parameter	Type of Measuring or Leak Detection Instrument	Location of Measuring Instrument (Tag No.)	Instrument Range	Failure State	Expected Range	Instrument Accuracy	Instrument Calibration Method No. and Range
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED

**PART V. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS)**

For purposes of Permit Part V, where reference is made to WAC 173-303-640, the following substitutions apply: substituting the terms "DBVS" for "tank system(s)," "sub-system(s)" for "tank(s)," "sub-system equipment" for "ancillary equipment," and "sub-system(s) or sub-system equipment of a DBVS" for "component(s)" in accordance with WAC 173-303-680, with the exception that these substitutions do not apply to the subsystems that are marked with an asterisk or an "a" on Permit Tables V.1. and V.4. and do not apply to ICV® Stations listed on Permit Tables V.1. and V.4. For purposes of Permit Part V., all references to Permit Attachment LL shall be read as references to Permit Attachment LL, as modified pursuant to Permit Condition V.I.

**V.A.        GENERAL CONDITIONS**

**V.A.1.     CONSTRUCTION AND MAINTENANCE**

[WAC 173-303-640, in accordance with WAC 173-303-680(2) and (3) and WAC 173-303-340].

- V.A.1.a. The Permittees shall construct the DBVS (listed in Permit Tables V.1. and V.4.), as specified in Permit Attachment LL and Permit Part V.
- V.A.1.b. The Permittees shall construct all containment systems for the DBVS as specified in Permit Attachment LL and Part V. of this Permit.
- V.A.1.c. The Permittees shall ensure all certifications required by specialists (e.g., independent, qualified registered professional engineer, independent corrosion expert, independent, qualified installation inspector, etc.) use the certification statement listed in WAC 173-303-810(13).
- V.A.1.d. The Permittees must ensure that proper handling procedures are adhered to in order to prevent damage to the DBVS during installation. Prior to covering, enclosing, or placing the new DBVS or component in use, an independent, qualified, installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of similar systems or components, must inspect the system for the presence of any of the following items:
- V.A.1.d.i. Weld breaks;
  - V.A.1.d.ii. Punctures;
  - V.A.1.d.iii. Scrapes of protective coatings;
  - V.A.1.d.iv. Cracks;
  - V.A.1.d.v. Corrosion; or
  - V.A.1.d.vi. Other structural damage or inadequate construction/installation.
- All discrepancies must be remedied before the DBVS is covered, enclosed, or placed into use [WAC 173-303-640(3)(c), in accordance with WAC 173-303-680(2) and (3)].
- V.A.1.e. For the DBVS components, as applicable, that are placed underground and that are back-filled, the Permittees must provide a backfill material that is a non-corrosive, porous, homogeneous substance. The backfill must be installed so that it is placed completely around the DBVS component and compacted to ensure that the DBVS component is fully and uniformly supported [WAC 173-303-640(3)(d), in accordance with WAC 173-303-680(2) and (3)].
- V.A.1.f. The Permittees must test for tightness the DBVS components, as applicable, prior to being covered, enclosed, or placed into use. If the DBVS components are found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the DBVS component being covered, enclosed, or placed into use [WAC 173-303-640(3)(e), in accordance with WAC 173-303-680(2) and (3)].
- V.A.1.g. The Permittees must ensure the DBVS equipment is supported and protected against physical damage and excessive stress due to settlement, vibration,

expansion, or contraction [WAC 173-303-640(3)(f), in accordance with WAC 173-303-680(2) and (3)].

- V.A.1.h. The Permittees must provide the type and degree of corrosion protection recommended by an independent corrosion expert, based on the information provided in Permit Attachment LL. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation [WAC 173-303-640(3)(g), in accordance with WAC 173-303-680(2) and (3)].
- V.A.1.i. For each DBVS sub-system holding dangerous waste which are acutely or chronically toxic by inhalation, the Permittees shall operate the system to prevent escape of vapors, fumes, or other emissions into the air [WAC 173-303-806(4)(i)(i)(B) and WAC 173-303-640(5)(e), in accordance with WAC 173-303-680].
- V.A.1.j. The independent DBVS installation inspection and subsequent written statements shall be certified pursuant to V.A.1.c. to comply with all requirements of WAC 173-303-640(3)(h), in accordance with WAC 173-303-680, and shall consider, but not be limited to, the following DBVS System installation documentation:
- V.A.1.j.i. Field installation report with date of installation;
  - V.A.1.j.ii. Approved welding procedures;
  - V.A.1.j.iii. Welder qualification and certifications;
  - V.A.1.j.iv. Hydro-test reports, as applicable, in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 1; American Petroleum Institute (API) Standard 620, or Standard 650, as applicable;
  - V.A.1.j.v. Tester credentials;
  - V.A.1.j.vi. Field inspector credentials;
  - V.A.1.j.vii. Field inspector reports;
  - V.A.1.j.viii. Field waiver reports; and
  - V.A.1.j.ix. Non-compliance reports and corrective action (including field waiver reports) and repair reports.
- V.A.1.k. The Permittees shall ensure periodic integrity assessments are conducted on the DBVS subsystems which are not marked with an asterisk or an "a" on Permit Tables V.1. and V.4., over the term of this Permit in accordance with WAC 173-303-680(2) and (3), as specified in WAC 173-303-640(3)(b), following the

description of the integrity assessment program and schedule in Permit Attachment II, as revised pursuant to Permit Condition II.D.2.

- V.A.1.l. The Permittees shall address problems detected during the DBVS System integrity assessments specified in Permit Condition V.A.1.k., following the integrity assessment program in Permit Attachment II, as modified pursuant to Permit Condition II.D.2.
- V.A.1.m. Process monitors/instruments, as specified in Permit Tables V.3. and V.6., shall be equipped with operational alarms to warn of deviation, or imminent deviation from the limits specified in Permit Tables V.7. and V.8. and Permit Attachment LL.
- V.A.1.n. The Permittees shall install and test all process and leak detection system monitors/instrumentation as specified in Permit Tables V.3. and V.6. in accordance with Permit Attachment LL.
- V.A.1.o. No dangerous and/or mixed waste shall be treated in the DBVS unless the operating conditions, specified under Permit Condition V.C. are complied with.
- V.A.1.p. The Permittees shall not place dangerous and/or mixed waste, treatment reagents, or other materials in the DBVS if these substances could cause the subsystem, subsystem equipment, or the containment system to rupture, leak, corrode, or otherwise fail [WAC 173-303-640(5)(a), in accordance with WAC 173-303-680(2)].
- V.A.1.q. The Permittees shall operate the DBVS to prevent spills and overflows using controls and practices as required under WAC 173-303-640(5)(b) and in Permit Condition II.C. [WAC 173-303-640(5)(b), in accordance with WAC 173-303-680(2) and (3) and WAC 173-303-806(4)(c)(ix)].
- V.A.1.r. The Permittees shall mark all DBVS sub-systems holding dangerous and/or mixed waste with labels, or signs, to identify the waste contained in the DBVS sub-systems. The labels, or signs, must be legible at a distance of at least fifty (50) feet, and must bear a legend which identifies the waste in a manner which adequately warns employees, emergency response personnel, and the public of the major risk(s) associated with the waste being stored or treated in the DBVS sub-systems [WAC 173-303-640(5)(d), in accordance with WAC 173-303-680(2)].
- V.A.1.s. The Permittees shall ensure that the secondary containment systems for the DBVS sub-systems listed in Permit Tables V.1. and V.4., are free of cracks or gaps to prevent any migration of dangerous and/or mixed waste or accumulated liquid out of the system to the soil, groundwater, or surface water at any time during use of the DBVS sub-systems. Any indication that a crack or gap may exist in the containment systems shall be investigated and repaired in accordance with Permit Attachment II, as revised pursuant to Permit Condition II.D.2. [WAC 173-303-640(4)(b)(i), WAC 173-303-640(4)(e)(i)(C), and WAC 173-303-640(6), in

accordance with WAC 173-303-680(2) and (3), WAC 173-303-806(4)(i)(B), and WAC 173-303-320].

- V.A.1.t. The Permittees must immediately, and safely, remove from service any DBVS or secondary containment system which through an integrity assessment is found to be "unfit for use" as defined in WAC 173-303-040, following Permit Condition V.A.1.v. The affected DBVS or secondary containment system must be either repaired or closed in accordance with Permit Condition V.A.1.v. [WAC 173-303-640(7)(e) and (f) and WAC 173-303-640(8), in accordance with WAC 173-303-680(3)].
- V.A.1.u. An impermeable interior coating or lining, as specified in Permit Attachment LL, shall be maintained for all concrete containment systems and concrete portions of containment systems for each DBVS sub-systems listed in Permit Tables V.1. and V.4. pursuant to WAC 173-303-640(4)(e)(i), in accordance with WAC 173-303-680(2), and concrete containment systems that have construction joints shall meet the requirements of WAC 173-303-640(4)(e)(ii)(C), in accordance with WAC 173-303-680(2). The coating shall prevent migration of any dangerous and/or mixed waste into the concrete. All coatings shall meet the following performance standards:
- V.A.1.u.i. The impermeable interior coating or lining must seal the containment surface such that no cracks, seams, or other avenues through which liquid could migrate are present;
- V.A.1.u.ii. The coating must be of adequate thickness and strength to withstand the normal operation of equipment and personnel within the given area such that degradation or physical damage to the coating or lining can be identified and remedied before dangerous and/or mixed waste could migrate from the system; and
- V.A.1.u.iii. The coating must be compatible with the dangerous and/or mixed waste, treatment reagents, or other materials managed in the containment system [WAC 173-303-640(4)(e)(ii)(D), in accordance with WAC 173-303-680(2) and (3) and WAC 173-303-806(4)(i)(A)].
- V.A.1.v. The Permittees shall inspect all secondary containment systems for the DBVS sub-systems listed in Permit Tables V.1. and V.4. in accordance with the Inspection Schedule specified in Permit Attachment II, as modified pursuant to Permit Condition II.D.2., and take the following actions if a leak or spill of dangerous and/or mixed waste is detected in these containment systems [WAC 173-303-640(5)(c) and WAC 173-303-640(6) and (7), in accordance with WAC 173-303-680(2) and (3), WAC 173-303-320, and WAC 173-303-806(4)(i)(B)]:
- V.A.1.v.i. Immediately, and safely, stop the flow of dangerous and/or mixed waste into the DBVS sub-systems or secondary containment system.

- V.A.1.v.ii. Determine the source of the dangerous and/or mixed waste.
- V.A.1.v.iii. Remove the dangerous and/or mixed waste from the containment area in accordance with WAC 173-303-680(2) and (3) as specified in WAC 173-303-640(7)(b). The dangerous and/or mixed waste removed from containment areas of the DBVS sub-systems shall be, as a minimum, managed as dangerous and/or mixed waste.
- V.A.1.v.iv. If the cause of the release was a spill that has not damaged the integrity of the DBVS sub-system, the Permittees may return the DBVS sub-system to service in accordance with WAC 173-303-680(2) and (3) as specified in WAC 173-303-640(7)(e)(ii). In such case, the Permittees shall take action to insure the incident that caused the dangerous and/or mixed waste to enter the containment system will not reoccur [WAC 173-303-320(3)].
- V.A.1.v.v. If the source of the dangerous and/or mixed waste is determined to be a leak from the primary DBVS System into the secondary containment system, or the system is unfit for use as determined through an integrity assessment or other inspection, the Permittees shall comply with the requirements of WAC 173-303-640(7) and take the following actions:
- Close the DBVS sub-system following procedures in WAC 173-303-640(7)(e)(i), in accordance with WAC 173-303-680 and Permit Condition II.H., as revised pursuant to Permit Condition II.H.9.; or
  - Repair and re-certify (in accordance with WAC 173-303-810(13)(a), as modified pursuant to Permit Condition V.A.1.c.) the DBVS, in accordance with Permit Attachment II, as revised pursuant to Permit Condition II.D.2. before the DBVS is placed back into service [WAC 173-303-640(7)(e)(iii) and WAC 173-303-640(7)(f), in accordance with WAC 173-303-680].
- V.A.1.v.vi. The Permittees shall document in the operating record actions/procedures taken to comply with i. through v. above as specified in WAC 173-303-640(6)(d), in accordance with WAC 173-303-680(2) and (3).
- V.A.1.v.vii. In accordance with WAC 173-303-680(2) and (3), the Permittees shall notify and report releases to the environment to Ecology as specified in WAC 173-303-640(7)(d).
- V.A.1.w. If liquids (e.g., dangerous and/or mixed waste leaks and spills, precipitation, fire water, liquids from damaged or broken pipes) cannot be removed from the secondary containment system within twenty-four (24) hours, Ecology will be verbally notified within twenty-four (24) hours of discovery. The notification shall provide the information in i., ii., and iii. listed below. The Permittees shall provide Ecology with a written demonstration within seven (7) business days, identifying at

a minimum [WAC 173-303-640(4)(c)(iv) and WAC 173-303-640(7)(b)(ii), in accordance with WAC 173-303-680(3) and WAC 173-303-806(4)(i)(i)(B)]:

V.A.1.w.i. Reasons for delayed removal;

V.A.1.w.ii. Measures implemented to ensure continued protection of human health and the environment; and

V.A.1.w.iii. Current actions being taken to remove liquids from secondary containment.

V.A.1.x. Air pollution control devices and capture systems in the DBVS shall be maintained and operated in a manner so as to minimize the emissions of air contaminants and to minimize process upsets. Procedures for ensuring that the air pollution control devices and capture systems in the DBVS System are properly operated and maintained so as to minimize the emission of air contaminants and process upsets shall be established.

V.A.1.y. In all future narrative permit submittals, the Permittees shall include DBVS sub-system names with the sub-system designation.

V.A.1.z. Changes to approved design, plans, and projected performance documentation in Permit Attachment LL for the DBVS shall require that the Permittee submit and receive written approval from Ecology, except as specified in Permit Conditions II.A.8., II.A.9., or II.I. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.

V.A.1.aa. Prior to initial receipt of dangerous and/or mixed waste in the DBVS, the Permittees shall obtain and keep on file in the DBVS operating record, written statements by those persons required to certify the design of the DBVS and supervise the installation of the DBVS, as specified in WAC 173-303-640(3)(b), (c), (d), (e), (f), and (g), in accordance with WAC 173-303-680, attesting that the DBVS and corresponding containment system listed in Permit Tables V.2. and V.5., were properly designed and installed, and that repairs, in accordance with WAC 173-303-640(3)(c) and (e) were performed [WAC 173-303-640(3)(a) and WAC 173-303-640(3)(h), in accordance with WAC 173-303-680(3)].

V.B. PERFORMANCE STANDARDS

The Permittees shall provide information supporting DBVS targeted and actual performance in the DBVS Campaign Plans and DBVS Campaign Summary Reports, respectively, as specified in Permit Conditions V.I.6., V.I.7., V.I.8., V.I.9., and V.I.10.

V.C. OPERATING CONDITIONS

[WAC-303-670(6), in accordance with WAC 173-303-680(2) and (3)].

- V.C.1. The Permittees shall operate the DBVS in accordance with Permit Attachment LL, Permit Part V., and in accordance with the following:
  - V.C.1.a. The Permittees shall operate the DBVS in order to maintain the systems and process parameters listed in Permit Tables V.3., V.6., V.7., and V.8., within the set-points specified in Permit Tables V.7. and V.8.
  - V.C.1.b. The Permittees shall operate the Emergency Parameter Control/Response System, specified in Permit Table V.8., to respond (e.g., automatically cut-off and/or lock-out the dangerous and mixed waste feed to the DBVS, etc.) as specified in Permit Table V.8. when the operating conditions exceed the set-points specified in Permit Table V.8.
  - V.C.1.c. The Permittees shall operate the Emergency Parameter Control/Response System, specified in Permit Table V.8., to respond (e.g., automatically cut-off and/or lock-out the dangerous and mixed waste feed to the DBVS, etc.) as specified in Permit Table V.8. when any instrument or component specified on Permit Tables V.7. and V.8. for setting or measuring the monitored parameter fail or operate outside its span value.
  - V.C.1.d. The Permittees shall operate the Emergency Parameter Control/Response System, specified in Permit Table V.8. to respond (e.g., automatically cut-off and/or lock-out the dangerous and mixed waste feed to the DBVS, etc.) as specified in Permit Table V.8. when any portion of the DBVS that is specified for operation in the Ecology Approved DBVS Campaign Plan pursuant to Permit Conditions V.I.6. and V.I.7. is bypassed. The terms "bypassed" and "bypass event" as used in Permit Part V. shall mean if any portion of the DBVS is bypassed so that gases are not treated as specified in the Ecology Approved DBVS Campaign Plan, pursuant to Permit Conditions V.I.6., V.I.7., and V.I.8.
  - V.C.1.e. In the event of a malfunction of the Emergency Parameter Control/Response System, specified in Permit Table V.8., to respond (e.g., automatically cut-off and/or lock-out the dangerous and mixed waste feed to the DBVS, etc.) as specified in Permit Table V.8. The Permittees shall not resume operations as prior to the malfunction until the problem causing the malfunction has been identified and corrected.
  - V.C.1.f. The Permittees shall manually implement the response specified in Permit Table V.8. when the operating conditions deviate from the limits specified in Permit Condition V.C.1.b., unless the deviation automatically, as specified in Permit Table V.8., activates the response sequence specified in Permit Conditions V.C.1.b., V.C.1.c., and/or V.C.1.d.
  - V.C.1.g. The Permittees shall control fugitive emissions from the DBVS by maintaining/operating the DBVS offgas systems in accordance with Permit Conditions II.A.4. and II.A.5.

V.C.1.h. The Permittees shall not exceed 50% of the organic design capacity of the carbon filter and shall change-out the carbon filter prior to commencement of the next DBVS Campaign if it is projected that this capacity would be exceeded during a DBVS Campaign.

V.C.1.i. The Permittees shall change-out the carbon filter following detection of organic break-through as specified in Permit Attachment LL.

V.D. INSPECTION REQUIREMENTS  
[WAC 173-303-680(3)].

V.D.1. The Permittees shall inspect the DBVS and the DBVS Emergency Parameter Control/Response System in accordance with the Inspection Schedules in Permit Attachment II, as modified pursuant to II.D.2.

V.D.2. The inspection data for DBVS and the DBVS Emergency Parameter Control/Response System shall be recorded, and the records shall be placed in the DBVS operating record for the DBVS, in accordance with Permit Conditions II.D. and II.G.

V.D.3. The Permittees shall comply with the inspection requirements specified in Permit Attachment II, as revised pursuant to Permit Condition II.D.2.

V.E. MONITORING REQUIREMENTS  
[WAC 173-303-670(5), (6), and (7) and WAC 173-303-807(2), in accordance with WAC 173-303-680(3)].

V.E.1. The Permittees shall comply with the monitoring requirements specified in Permit Attachment LL, Ecology approved DBVS Campaign Plan, and Permit Part V.

V.E.2. The Permittees shall operate, calibrate, and maintain the carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), particulate emission, and organic monitors, and any other monitors required for the DBVS by the Ecology approved DBVS Campaign Plan in accordance with the EPA Performance Specifications in 40 CFR Part 60, Appendix B, as specified in Attachment LL of this Permit, the Ecology approved DBVS Campaign Plan, and Part V. of this Permit.

V.E.3. The Permittees shall operate, calibrate, and maintain the instruments specified on Permit Tables V.3., V.6., and V.8., in accordance with Attachment LL of this Permit, the Ecology approved DBVS Campaign Plan, and Part V. of this Permit.

V.F. RECORDKEEPING REQUIREMENTS  
[WAC 173-303-380 and WAC 173-303-680(3)].

- V.F.1. The Permittees shall record and maintain in the operating record for the DBVS, all monitoring, calibration, maintenance, test data, and inspection data compiled under the conditions of this Permit, in accordance with Permit Conditions II.D., and II.G.
- V.F.2. The Permittees shall record in the DBVS operating record the date, time, and duration of Emergency Parameter Control/Response System activation (e.g., automatic waste feed cutoffs and/or lockouts, etc.) including the triggering parameters, reason for the deviation, and recurrence of the incident. The Permittees shall also record all incidents of the Emergency Parameter Control/Response System function failures, including the corrective measures taken to correct the condition that caused the failure.
- V.G. CLOSURE
- The Permittees shall close the DBVS System in accordance with Permit Condition II.H., as revised pursuant to Permit Condition II.H.9.
- V.H. PHASE 1 AND PHASE 2 CAMPAIGNS  
[WAC 173-303-670(5), (6), and (7), and WAC 173-303-807(2), in accordance with WAC 173-303-680(2) and (3)].
- V.H.1. The Permittees shall conduct Phase 1 and Phase 2 in accordance with Permit Attachment LL, Ecology approved DBVS Campaign Plan and Permit Part V.
- V.H.2. Phase 1 and Phase 2 Limitations and Allowable Waste Feed
- V.H.2.a. The Permittees shall comply with the Phase 1 and Phase 2 feed limits specified on Permit Tables V.7. and V.8., Permit Conditions II.A. and II.B., the Ecology approved DBVS Campaign Plan pursuant to Permit Conditions V.I.6., V.I.7., and V.I.8., and Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8., and amended to exclude feed of D001 and D003.
- V.H.3. The Permittees shall not commence Phase 1 until the Permittees have submitted and received Ecology approval for the Phase 1 DBVS Campaign Plan pursuant to Permit Condition V.I.6.
- V.H.4. The Permittees shall not commence the first campaign under Phase 2 until the following has occurred:
- V.H.4.a. The Permittees have submitted the portions of the Phase 1 DBVS Campaign Summary Report to Ecology, as specified in Permit Condition V.I.9., that were identified in DBVS Phase 1 Campaign Plan, as approved by Ecology, as critical to development of the first campaign under Phase 2's DBVS Campaign Plan.
- V.H.4.b. The Permittees have submitted and received Ecology approval for the first Phase 2 DBVS Campaign Plan pursuant to Permit Condition V.I.7.

V.H.5. The Permittees shall not commence each subsequent campaign under Phase 2 until the following has occurred:

V.H.5.a. The Permittees have submitted the portions of the previous Phase 2 DBVS Campaign Summary Report(s) to Ecology, as specified in Permit Condition V.I.9., that were identified in the previous DBVS Phase 2 Campaign Plan(s), as approved by Ecology, as critical to development of this subsequent DBVS Phase 2 Campaign Plan.

V.H.5.b. The Permittees have submitted and received Ecology approval for the DBVS Campaign Plan under Phase 2, which the Permittees are requesting approval to commence pursuant to Permit Conditions V.I.7. and/or V.I.8.

V.I. COMPLIANCE SCHEDULES

V.I.1. All information identified for submittal to Ecology in V.1.2. through V.I.5. and in V.I.10. of this compliance schedule must be signed and certified in accordance with requirements in WAC 173-303-810(12).

V.I.2. Prior to construction of each secondary containment and leak detection system for the DBVS as identified in Permit Tables V.2. and V.5., the Permittees shall submit and receive Ecology approval for the engineering information as specified below, for incorporation into Permit Attachment LL. At a minimum, engineering information specified below will show the following as described in WAC 173-303-640, in accordance with WAC 173-303-680 (the information specified below will include dimensioned engineering drawings and information on sumps and floor drains). Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:

V.I.2.a. IQRPE Reports (specific to foundation, secondary containment, and leak detection system) shall include review of design drawings, calculations, and other information on which the certification report is based and shall include as applicable, but not limited to, review of such information described below- (drawings, specifications, etc.). IQRPE Reports shall be consistent with the information separately provided in b. through f. below [WAC 173-303-640(3)(a), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)];

V.I.2.b. Design drawings to include references to codes and standards (General Arrangement Drawings, in plan, and cross sections) and projected performance documentation for the foundation, secondary containment including liner installation details, and leak detection methodology. These items should show the dimensions, volume calculations, and location of the secondary containment system, and should include items such as floor/pipe slopes to sumps, tanks, floor drains [WAC 173-303-640(4)(b) through (f) and WAC 173-303-640(3)(a), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)];

- V.I.2.c. The Permittees shall provide the design criteria (references to codes and standards, load definitions, and load combinations, materials of construction, and analysis/design methodology) and typical design details for the support of the secondary containment system. This information shall demonstrate the foundation will be capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement, compression, or uplift [WAC 173-303-640(4)(c)(ii), in accordance with WAC 173-303-680(2) and WAC 173-303-806(4)(i)(i)(B)];
- V.I.2.d. A description of materials and equipment used to provide corrosion protection for external metal components in contact with soil, including factors affecting the potential for corrosion [WAC 173-303-640(3)(a)(iii)(B), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)(A) through (B)];
- V.I.2.e. Secondary containment/foundation, and leak detection system, materials selection documentation (including, but not limited to, concrete coatings and water stops, and liner materials) as applicable [WAC 173-303-806(4)(i)(i)(A) through (B)]; and
- V.I.2.f. Detailed description of how the secondary containment for the DBVS will be installed in compliance with WAC 173-303-640(3)(c), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)(A) through (B).
- V.I.3. Prior to installation of each sub-system as identified in Permit Tables V.1. and V.4., the Permittees shall submit and receive approval from Ecology for the engineering information as specified below, for incorporation into Permit Attachment LL (the information specified below will include dimensioned engineering drawings). Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3.:
- V.I.3.a. IQRPE Reports verifying that the sub-system that are not marked with an asterisk on Permit Tables V.1. and V.4. have sufficient structural integrity and are acceptable for the storing and treating of dangerous and/or mixed waste shall include review of design drawings, calculations, and other information on which the certification report is based and shall include as applicable a review of such information described below. The IQRPE Reports shall be consistent with the information separately provided in b. through e. below, and the IQRPE Report specified in Permit Condition V.I.2. [WAC 173-303-640(3)(a), in accordance with WAC 173-303-680(2) and WAC 173-303-806(4)(i)(i)];
- V.I.3.b. For subsystems that are marked with an asterisk on Permit Tables V.1. and V.4. the Permittees shall provide design information including: updated Appendix B of Permit Attachment LL process flow diagrams, piping and instrumentation diagrams (including pressure control systems and mass and energy balances), physical and chemical tolerances of equipment, projected performance documentation, instrumentation/control loops, and materials of construction;

- V.I.3.c. For subsystems that are not marked with an asterisk on Permit Tables V.1. and V.4. shall provide design information including: design drawings (General Arrangement Drawings in plan and cross section, references to codes and standards, updated Appendix B of Permit Attachment LL process flow diagrams, piping and instrumentation diagrams [including pressure control systems and mass and energy balances]), projected performance documentation, instrumentation/control loops for each subsystem, materials of construction, analysis/design methodology, fan curves for exhaust fan 1 (36-N31-025) and exhaust fan 2 (36-N31-026), physical and chemical tolerances of equipment, carbon filter organic (volatile, semi-volatile and non-volatile) design capacity and typical design details to support the subsystems and projected operational capability [WAC 173-303-640(3)(a), in accordance with WAC 173-303-680(2) and WAC 173-303-806(4)(i)(i)(B)];
- V.I.3.d. A detailed description of how the subsystems that are not marked with an asterisk or an "a" on Permit Tables V.1. and V.4. will be installed in compliance with WAC 173-303-640(3)(c), (d), and (e), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)(B); and
- V.I.3.e. Subsystem design to prevent escape of vapors and emissions of acutely or chronically toxic (upon inhalation) EHW, and to prevent the build-up of explosive gases/vapors [WAC 173-303-640(5)(e), in accordance with WAC 173-303-680(2) and WAC 173-303-806(4)(i)(i)(B)].
- V.I.4. Prior to initial receipt of dangerous and/or mixed waste in the DBVS, the Permittees shall submit and receive Ecology approval of the following, as specified below, for incorporation into Permit Attachment LL. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions V.I.2. and V.I.3., as approved by Ecology:
- V.I.4.a. A correction factor, with supporting description, and monitoring, that can be applied to the performance standards specified in Permit Condition V.I.6.f. that would assure that the design and operation of the DBVS promotes the reduction of the total quantity of dangerous/hazardous constituents released as air emissions by maximizing removal and destruction of constituents prior to release from the exhaust stack versus significant reduction of the concentration of the emissions in the exhaust by increased dilution air. The supporting description shall discuss how it will be applied and the appropriateness of its application to each performance standard specified in Permit Condition V.I.6.f. and specific details on how the factor will be monitored during operation.
- V.I.4.b. Detailed Description of an Emergency Parameter Control/Response System addressing operating parameters specified in Permit Tables V.7. and V.8., as approved pursuant to Permit Conditions V.I.4.k. and V.I.6.c.

- V.I.4.c. Integrity assessment program and schedule for the DBVS shall address the conducting of periodic integrity assessments on the DBVS subsystems which are not marked with an asterisk or an "a" on Permit Tables V.1. and V.4., over the life of the system, as specified in Permit Condition V.A.1.k. and WAC 173-303-640(3)(b), in accordance with WAC 173-303-680, and descriptions of procedures for addressing problems detected during integrity assessments. The schedule must be based on past integrity assessments, age of the system, materials of construction, characteristics of the waste, and any other relevant factors [WAC 173-303-640(3)(b), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)(B)].
- V.I.4.d. Detailed plans and descriptions, demonstrating the leak detection system is operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of dangerous and/or mixed waste or accumulated liquid in the secondary containment system within twenty-four (24) hours [WAC 173-303-640(4)(c)(iii)]. Detection of a leak of at least 0.1 gallons per hour within twenty-four (24) hours is defined as being able to detect a leak within twenty-four (24) hours. Any exceptions to this criteria must be approved by Ecology in accordance with WAC 173-303-680, WAC 173-303-640(4)(c)(iii), and WAC 173-303-806(4)(i)(i)(b).
- V.I.4.e. Detailed operational plans and descriptions, demonstrating that spilled or leaked waste and accumulated liquids can be removed from the secondary containment system within twenty-four (24) hours [WAC 173-303-806(4)(i)(i)(B)].
- V.I.4.f. Descriptions of operational procedures demonstrating appropriate controls and practices are in place to prevent spills and overflows from the DBVS or containment systems in compliance with WAC 173-303-640(5)(b)(i) through (iii), in accordance with WAC 173-303-680 and WAC 173-303-806(4)(i)(i)(B).
- V.I.4.g. Description of procedures for inspection and repair of the DBVS [WAC 173-303-640(6) and WAC 173-303-640(7)(e) and (f), in accordance with WAC 173-303-680, WAC 173-303-320, WAC 173-303-806(4)(a)(v), and WAC 173-303-806(4)(i)(i)(B)].
- V.I.4.h. The Permittees will provide a description of procedures for management of dangerous and/or mixed waste as specified in WAC 173-303-640(9) and (10) with the waste codes listed in Table 6-1, excluding characteristic code D001 and D003 of Permit Attachment BB, in accordance with Permit Attachment BB, as changed pursuant to Permit Conditions II.B.7. and II.B.8.
- V.I.4.i. A description of the tracking system used to manage dangerous and/or mixed waste generated throughout the DBVS, pursuant to WAC 173-303-380.
- V.I.4.j. Detailed description of procedures for start-up and shutdown of waste feed and controlling and minimizing emissions in the event of an equipment malfunction,

including off-normal and emergency shutdown procedures, procedures for switching to back-up systems and tie into Permit Tables V.7. and V.8. and Appendix E of Permit Attachment LL.

- V.I.4.k. Emergency Condition Parameter Limit Values as Appendix E of Permit Attachment LL and Permit Tables V.3., V.6., and V.8. completed to include this information. These emergency condition parameters should include parameters to warn of potential for fire, explosion, loss of sufficient vacuum in the DBVS offgas systems to recover emissions from the areas, systems or units, loss of DBVS subsystem vessel integrity, and off-normal operating conditions that could lead to potential for release from DBVS. Appendix E shall include a narrative description and information to support the parameters and limits values, parameter loop narratives, along with their process functions, the response required when they trip, and instrument fail safe condition.
- V.I.4.l. ICV® Container Refractory Information as Appendix F of Permit Attachment LL.
- V.I.4.m. Continuous emission monitor for measuring organic breakthrough of the DBVS carbon filter. Include monitor specifications, proposed location, monitoring plan and documentation that the monitor is capable of detecting the organics (volatile, semi-volatile, and non-volatile) that could potentially be emitted from the DBVS.
- V.I.4.n. Detailed procedures for maintaining and documenting in the DBVS operating record, a running count of the organic inventory fed to DBVS Waste Dryer from the DBVS Facility on a per campaign basis of spiked and non-spiked constituents and change-out of the carbon filter so as not to exceed fifty percent (50%) of the organic design capacity of the carbon filter.
- V.I.4.o. Operation, calibration and maintenance procedures for the particulate matter, carbon monoxide, nitrogen oxides, sulfur oxides, organic continuous emission monitors, and the monitoring for the correction factor under Permit Condition V.I.4.a., including references to the technically appropriate specifications from 40 CFR Part 60, Appendix B, for each parameter.
- V.I.4.p. Description of the design/operating resolutions developed to address the following potential DBVS shortfalls:
  - V.I.4.p.i. Main offgas system not meeting ASME AG-1, N509, N510.
  - V.I.4.p.ii. Tri-Mer subsystem capacity insufficient to handle incoming gas flow.
  - V.I.4.p.iii. Excessive ICV® Package bottom temperature.
  - V.I.4.p.iv. Waste Dryer not demonstrated to be able to achieve a total operating efficiency of at least seventy percent (70%).

- V.I.4.q. Section 4.2.14, page 4-10 of Permit Attachment LL, first sentence is revised as follows: "The mixer/dryer emissions will be partially treated for moisture removal using a glycol-cooled condenser prior to being routed to the main offgas treatment system."
- V.I.4.r. Section 4.2.16, page 4-12 of Permit Attachment LL, second sentence is revised as follows: "However, if the Phase 1 offgas treatment system performance does not meet expectations, changes to the system will be made with prior Ecology approval."
- V.I.5. Prior to initial receipt of dangerous and/or mixed waste in the DBVS, the Permittees shall submit and receive Ecology approval of the following as specified below for incorporation into this Permit. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions V.I.2., VI.3., and V.I.4., as approved by Ecology:
- V.I.5.a. Permit Tables V.3. and V.6. shall be completed for DBVS leak detection system instruments and parameters, to provide the information as specified in each column heading [WAC 173-303-680, WAC 173-303-806(4)(i)(i)(A) through (B), and WAC 173-303-806(4)(i)(v)].
- V.I.5.b. Permit Tables V.1. and V.4. amended as follows [WAC 173-303-680 and WAC 173-303-806(4)(i)(i)(A) through (B)]:
- V.I.5.b.i. Under column 1, update and complete list of dangerous and/or mixed waste DBVS sub-systems.
- V.I.5.b.ii. Under column 2, update and complete system designations.
- V.I.5.b.iii. Under column 3, replace 'Reserved' with the appropriate references (e.g., drawing numbers, etc.) to the updated portions of Permit Attachment LL.
- V.I.5.b.iv. Under column 4, update and complete list of narrative description, tables, and figures.
- V.I.5.b.v. Under column 5, update and replace "Reserved" with the appropriate capacity.
- V.I.5.c. Submit Permit Tables V.2. and V.5. completed to provide for all secondary containment sumps and floor drains, the information as specified in each column heading consistent with information to be provided in V.I.2.a. through V.I.2.f. above.
- V.I.6. Prior to initial receipt of dangerous and/or mixed waste in the DBVS, the Permittees shall submit and receive approval from Ecology for the Phase 1 DBVS Campaign Plan. Such approval shall not require a permit modification under Permit

Conditions I.C.2. and I.C.3. The Phase 1 DBVS Campaign Plan shall include the information specified in Section 5 and Appendix A of Permit Attachment LL in addition to the following:

- V.I.6.a. Updated Demonstration Test Matrix, as appropriate to the DBVS Campaign Plan and identification of the portions of the information expected to be collected during this campaign and to be included in this DBVS Campaign Summary Report, that are critical to development of subsequent DBVS Campaign Plan(s), including clearly identifying which DBVS Campaign Plan(s) the information is projected to be critical to.
- V.I.6.b. Sampling, analysis, and QA/QC procedures/methods for any constituents/samples necessary to implement the DBVS Campaign Plan that were not addressed in Permit Attachment BB, as revised pursuant to Permit Conditions II.B.7. and II.B.8.
- VI.6.c. Updated, as appropriate to the DBVS Campaign Plan, Appendix E of Permit Attachment LL and Permit Tables V.3., V.6., and V.8. completed to include this updated information. Appendix E shall include a narrative description and information to support the updated parameters and limits values specified.
- VI.6.d. Changes to DBVS Facility including updates to all impacted portions of the Permit and Permit Attachments, as appropriate to the DBVS Campaign Plan.
- V.I.6.e. Documentation (e.g., engineering calculations, test data, and/or manufacturer/vendor's warranties/operations and maintenance documentation, etc.) to support that the DBVS Campaign Plan design and operation during the campaign is projected to meet the performance standards specified in Permit Condition V.I.6.f. within and outside of expected bounds of DBVS operations:

(For purposes of this permit condition outside of expected bounds of process operations shall be defined as follows):

Fifty percent (50%) of the metals specified on Table V.7., as fed to the DBVS Waste Dryer from the DBVS Waste and Simulant Staging Tank Feed System are retained in the ICV® Melt and the remainder of the metals enter the main offgas treatment system (as specified on Permit Tables V.1. and V.4. and Permit Attachment LL), with the exception of mercury which would be assumed to enter the main offgas treatment system (as specified on Permit Tables V.1. and V.4. and Permit Attachment LL) at one hundred percent (100%) of the concentration as fed to the DBVS Waste Dryer from the DBVS Waste and Stimulant Staging Tank Feed System.

Zero percent (0%) of the organics as fed to the DBVS Waste Dryer from the DBVS Waste and Simulant Staging Tank Feed System are retained in the ICV® Melt. One hundred percent (100%) of the volatile organics, and fifty percent (50%) of the semi-volatile organics as fed to the DBVS Waste Dryer from the DBVS Waste and

Simulant Staging Tank Feed System enter the Dryer Offgas Treatment System, which includes the Main Offgas Treatment System subsystems downstream of mist eliminator #3 (36-N24-041). Fifty percent (50%) of the semi-volatile organics and one hundred percent (100%) of nonvolatile organics as feed to the DBVS Waste Dryer from the DBVS Waste and Simulant Staging Tank Feed System enter the Main Offgas Treatment System (as specified on Permit Tables V.1. and V.4. and Permit Attachment LL).

Zero percent (0%) of the constituents that contribute to the formation of HCl, NO<sub>x</sub>, and SO<sub>x</sub> as fed to the DBVS Waste Dryer from the DBVS Waste and Simulant Staging Tank Feed System are retained in the ICV® melt and one hundred percent (100%) of these constituents that contribute to the formation of HCl, NO<sub>x</sub>, and SO<sub>x</sub> as fed to DBVS Waste Dryer from the DBVS Waste and Simulant Staging Tank Feed System are available to form HCL, NO<sub>x</sub>, and SO<sub>x</sub> in the ICV® melt or in Main Offgas Treatment System (as specified on Permit Tables V.1. and V.4. and Permit Attachment LL).

Dryer Offgas Treatment System and the Main Offgas Treatment System operation at or below lower bounds of expected efficiencies, as specified on Permit Tables V.1. and V.4. and Permit Attachment LL.

V.1.6.f. Performance Standards (as referenced in Permit Condition V.I.6.e.)

V.1.6.f.i. A destruction and removal efficiency (DRE) of 99.99 percent (99.99%) for the Organic Compounds listed on Table 6-1 of Permit Attachment BB [40 CFR §63.1203(c)(1), 40 CFR 63.1203(c)(2), in accordance with WAC 173-303-680(2)]:

DRE in this permit condition shall be calculated in accordance with the formula given below:

$$DRE = [1 - (W_{out}/W_{in})] \times 100\%$$

Where:

$W_{in}$  = mass feed-of the organic compound in a waste feed stream; and

$W_{out}$  = mass emission of the same organic compound present in emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere.

V.I.6.f.ii. Particulate matter emissions from the DBVS offgas exhaust stack (36-N26-024) prior to the atmosphere not exceeding 34 mg/dscm (0.015 grains/dscf) [40 CFR §63.1203(b)(7), in accordance with WAC 173-303-680(2)].

V.I.6.f.iii. Hydrochloric acid and chlorine gas emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 21 ppmv, combined [40 CFR §63.1203(b)(6), in accordance with WAC 173-303-680(2)].

- V.I.6.f.iv. Dioxin and Furan TEQ emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 0.2 nanograms (ng)/dscm [40 CFR §63.1203(b)(1), in accordance with WAC 173-303-680(2)].
- V.I.6.f.v. Mercury emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 45 µg/dscm [40 CFR §63.1203(b)(2), in accordance with WAC 173-303-680(2)].
- V.I.6.f.vi. Lead and cadmium emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 120 µg/dscm, combined [40 CFR §63.1203(b)(3), in accordance with WAC 173-303-680(2)].
- V.I.6.f.vii. Arsenic, beryllium, and chromium emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 97 µg/dscm, combined [40 CFR §63.1203(b)(4), in accordance with WAC 173-303-680(2)].
- V.I.6.f.viii. Carbon monoxide (CO) emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 100 parts per million (ppm) by volume, over an hourly rolling average (as measured and recorded by the continuous monitoring system), dry basis [40 CFR §63.1203(b)(5)(i), in accordance with WAC 173-303-680(2)].
- V.I.6.f.ix. Hydrocarbon emissions from the DBVS offgas exhaust stack (36-N26-024) prior to release to the atmosphere not exceeding 10 parts per million (ppm) by volume, over an hourly rolling average (as measured and recorded by the continuous monitoring system), dry basis, and reported as propane [40 CFR §63.1203(b)(5)(ii), in accordance with WAC 173-303-680(2)].
- V.I.6.g. Document that fifty percent (50%) of the organic design capacity of the carbon filter, as specified in Permit Attachment LL, will not be exceeded during this DBVS Campaign.
- V.I.6.h. Documentation of the expected levels of constituents in DBVS feed materials and additives during the DBVS Campaign which have the potential to impact the performance of the DBVS with respect to the Performance Standards identified in Permit Condition V.I.6.f. and update Permit Tables V.7. and V.8.
- VI.6.i. Updated Appendix B of the Permit Attachment LL to reflect the equipment configuration that will be followed for the DBVS Campaign.
- V.I.7. Prior to commencement of the Phase 2 DBVS Campaign and prior to commencement of each Phase 2 DBVS Campaign, Permittees shall submit and receive approval from Ecology for the Phase 2 DBVS Campaign Plan, except as specified in Permit Condition V.I.8. Such approval shall not require a permit modification under Permit Conditions I.C.2. and I.C.3. The Phase 2 DBVS Campaign Plan shall include the information specified in Permit Condition V.I.6.

In addition, the Phase 2 DBVS Campaign Plans designed to provide "Feed Envelope Verification and/or Process Improvement," shall include the following:

- V.I.7.a. Emission testing for demonstrating performance standards listed in Permit Condition V.I.6.f.
- V.I.7.b. Detailed description of sampling and monitoring procedures including sampling and monitoring locations in the system, the equipment to be used, sampling and monitoring frequency, planned analytical procedures for sample analysis and a short summary narrative description of each stack sample method with identification of the performance standard(s) identified in Permit Condition V.I.6.f. that the method will be used to demonstrate the performance of the DBVS.
- V.I.8. The Permittee shall not require Ecology approval for a Phase 2 DBVS Campaign Plan(s) prior to commencement of the individual campaign under the following conditions, as an exception to Permit Condition V.I.7. The first Phase 2 DBVS Campaign Plan and the DBVS Phase 2 Campaign Plan which addresses the information specified in Permit Conditions V.I.7.a. and V.I.7.b. are not eligible for this exception. Any DBVS Phase 2 Campaign Plan that qualifies for this exception shall be considered an Ecology Approved DBVS Campaign Plan for the purposes of this Permit:
  - V.I.8.a. DBVS Campaign Plans that do not require submittal of information under Permit Conditions V.I.6.b., V.I.6.c., V.I.6.d., or V.I.6.i.
- V.I.9. The Permittees shall submit to Ecology a draft DBVS Campaign Summary Report within ninety (90) days after the completion of each campaign that includes the following (NOTE: Preliminary analytical data is acceptable):
  - V.I.9.a. Information specified in Section 9.3.1 of Permit Attachment GG;
  - V.I.9.b. Information specified in Section 5 and Appendix A of Permit Attachment LL;
  - V.I.9.c. Information collected to document the capability of the DBVS to meet the performance standards specified in Permit Condition V.I.6.f.;
  - V.I.9.d. Information collected to document organic design capacity remaining in DBVS Carbon Filter; and
  - VI.9.e. Information collected to document implementation of the DBVS control system during the campaign including:
    - V.I.9.e.i. The parameter(s) that deviated from the set-point(s) in Permit Table V.8.;
    - V.I.9.e.ii. The magnitude, dates, and duration of the deviations;

- V.I.9.e.iii. Results of the investigation of the cause of the deviations; and
- V.I.9.e.iv. Corrective measures taken to minimize future occurrences of the deviations.
- V.I.10. The Permittees shall submit to Ecology the Final DBVS Campaign Report within 120 days after the completion of the final campaign summary report as specified in V.I.9. that includes the information specified in Permit Conditions V.I.9.b., c., d., e., and the following:
- V.I.10.a. The information specified in Section 9.3.2 of Permit Attachment GG; and
- V.I.10.b. All quarterly Calibration Error and Annual Performance Specification Tests for monitors conducted in accordance with Permit Condition V.E.2.
- VI.10.c. ICV® Package detailed final limitations for size, durability, compressibility, stacking, handling, retrievability from storage and after final disposal, outside and inside package residual contamination, disposal facility, and testing/acceptance requirements.

**TABLE V.1. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) -  
PHASE 1 DESCRIPTION FOR NON-MAJOR COMPONENTS (E.G., PUMPS,  
FILTERS, FANS, COMPRESSORS, ETC. NOT SPECIFICALLY LISTED)**

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Control system for feed from the Waste & Simulant Staging Tanks to Waste Dryer <sup>a*</sup> (Waste Transfer Pump Skid)	32-D58-007	RESERVED	Sections 2.3.2, 2.3.3, 4.2, 4.2.1, 4.2.2.1, 4.2.3, 4.2.4, 4.2.12, 4.2.17; Table 4-1; Figures 2-2, B-1, and B-4	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Waste Dryer including:	33-D25-006	RESERVED	Sections 2.3.3, 4.2, 4.2.1, 4.2.8, 4.2.12, 4.2.14, 4.2.15, 4.2.17;	2645
Dust Recycle Feed to Dryer <sup>a</sup>	00-A-0016	RESERVED	Tables 4-1, 4-5; Figures 2-2, B-1, B-2, B-4, and B-5	NA
Waste Drying System including:	33-D58-068	RESERVED	Sections 2.3.3, 4.2, 4.2.1, 4.2.8, 4.2.12, 4.2.14, 4.2.15, 4.2.17;	N/A
Control system for clean soil feed to dryer <sup>a*</sup>			Tables 4-1, 4-5; Figures 2-2, B-1, and B-4	
The waste dryer steam supply control system <sup>a*</sup>				

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
<b>DRYER OFFGAS TREATMENT SYSTEM</b>				
Dryer Offgas Condenser including:  Condenser chilled water feed control system <sup>a*</sup>	33-D10-005	RESERVED	Sections 4.2.14, 4.2.17; Tables 4-2, 4-3, 4-5; Figures 2-2, B-1, and B-4	NA
<b>ICV® STATIONS</b>				
Vitrification Container Preparation*	RESERVED	RESERVED	Sections 4.2.9, 4.2.17; Tables 4-1, 4-5; Figures 2-2 and B-1	N/A
ICV® System (Container Waste Fill, ICV® Melt & Vented Cooling) including:  Dry waste feed control system <sup>a</sup>	RESERVED	RESERVED	Section 2.2.1, 4.2.11, 4.2.12, 4.2.17; Table 4-1; Figures 2-2, B-1, and B-4	N/A
Top-off, and Container Sealing including:  Top-off soil feed control system <sup>a*</sup>	RESERVED	RESERVED	Section 2.2.1, 4.2.11, 4.2.12, 4.2.17; Table 4-1; Figures 2-2, B-1, and B-4	N/A
Transport to Storage Pad (Sample Point)*	RESERVED	RESERVED	Section 2.2.1, 4.2.11; Figures 2-2, B-1, and B-4	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
<b>MAIN OFFGAS TREATMENT SYSTEM</b>				
Sintered Metal Filter #1	36-N02-019	RESERVED	Sections 4.2.12, 4.2.15, 4.2.17; Table 4-2; Figures B-2 and B-5	N/A
Sintered Metal Filter #2	36-N02-020	RESERVED	Sections 4.2.12, 4.2.15, 4.2.17; Table 4-2; Figures B-2 and B-5	N/A
<b>Venturi Scrubber System (VSS)-1</b> Quencher #1	36-N83-034	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17; Tables 4-1, 4-3; Figures B-2 and B-5	RESERVED
<b>VSS-1</b> Scrubber Feed System Tank #1 <sup>a*</sup> includes: Caustic make-up feed control system <sup>a*</sup>	36-D74-052	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17; Table 4-5; Figures B-2 and B-5	N/A
<b>VSS-1</b> Heat Exchanger #1 includes: Chilled water feed control system <sup>a*</sup>	36-D30-046	RESERVED	Figures B-2 and B-5	RESERVED

<b>Sub-system Description</b>	<b>Sub-system Designation</b>	<b>Engineering Description (Drawing No., Specification No., etc.)</b>	<b>Narrative Description, Tables and Figures</b>	<b>Maximum Capacity (gallons)</b>
<b>VSS -1</b> Scrubber #1	36-N73-035	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17; Tables 4-1, 4-2, 4-4, 4-5; Figures B-2 and B-5	RESERVED
<b>VSS-1</b> Mist Eliminator #1	36-N24-036	RESERVED	Sections 4.2.15, 4.2.17; Tables 4-1, 4-2, 4-3; Figures B-2 and B-5	N/A
<b>Venturi Scrubber System (VSS)-2</b> Quencher #2	36-N83-037	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17; Tables 4-1, 4-2, 4-3; Figures B-2 and B-5	RESERVED
<b>VSS-2</b> Scrubber Tank Feed System #2 <sup>a*</sup> includes: Caustic make-up feed control system <sup>a*</sup>	36-D74-054	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17; Table 4-5; Figures B-2 and B-5	N/A
<b>VSS-2</b> Heat Exchanger #2 includes: Chilled water feed control system <sup>a*</sup>	36-D30-047	RESERVED	Figures B-2 and B-5	RESERVED

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
VSS-2 Scrubber #2	36-N73-038	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-4, 4-5; Figures B-2 and B-5	RESERVED
VSS-2 Mist Eliminator #2	36-N24-039	RESERVED	Sections 4.2.15, 4.2.17; Figures B-2 and B-5	N/A
Scrubber Condenser	36-D10-040	RESERVED	Figures B-2 and B-5	N/A
Mist Eliminator #3	36-N24-041	RESERVED	Figures B-2 and B-5	N/A
HEPA Filter Heater*	36-N84-042	RESERVED	Sections 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-2, 4-3, 4-5, 4-6; Figures 2-2 and B-2	N/A
HEPA Filters #1 #2 #3	36-NO2-043 36-NO2-044 36-NO2-045	RESERVED RESERVED RESERVED	Sections 4.2.12, 4.2.15, 4.2.17; Tables 4-2, 4-6; Figures B-2 and B-5	N/A
Carbon Filter	36-NO2-064	RESERVED	Sections 4.2.12, 4.2.15, 4.2.17, 4.3.3; Tables 4-2, 4-6; Figures 2-2, B-2, and B-5	N/A
Offgas Polishing Filter	36-NO2-79	RESERVED	Figures 2-2 and B-3	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Tri-Mer Quencher includes: Water feed control system <sup>a*</sup>	36-N83-068	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer OX1 Tower including: H <sub>2</sub> SO <sub>4</sub> feed control system <sup>a*</sup> NaClO <sub>2</sub> feed control system <sup>a*</sup>	36-D77-069	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer RC1 Tower & RC1 Tower Sump including: Na <sub>2</sub> S feed control system <sup>a*</sup> NaOH feed control system <sup>a*</sup>	36-D77-070 36-D74-074	RESERVED RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer OX2 Tower including: H <sub>2</sub> SO <sub>4</sub> feed control system <sup>a*</sup> NaClO <sub>2</sub> feed control system <sup>a*</sup>	36-D77-071	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Tri-Mer RC2 Tower & RC2 Tower Sump including: Na <sub>2</sub> S feed control system <sup>a*</sup> NaOH feed control system <sup>a*</sup>	36-D77-072  36-D74-075	RESERVED  RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer CC Tower & CC Tower Sump including: NaOH feed control system <sup>a*</sup>	36-D77-073  36-D74-076	RESERVED  RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
SCR Heater*	36-N84-078	RESERVED	Sections 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5, 4-6; Figures 2-2, B-3, and B-6	N/A
SCR Catalyst Bed including: Ammonia feed control system <sup>a*</sup>	36-D59-003	RESERVED	Sections 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5, 4-6; Figures 2-2, B-3, and B-6	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
SCR Heat Exchanger*	36-D30-077	RESERVED	Sections 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5, 4-6; Figures 2-2, B-3, and B-6	N/A
Ammonia scrubber including: Dilute H <sub>2</sub> SO <sub>4</sub> feed control system <sup>a*</sup>	RESERVED	RESERVED	Figures B-3 and B-6	N/A
Offgas Exhaust Stack*	36-N26-024	RESERVED	Section 4.2.12, 4.2.17; Figures 2-2, B-3, and B-6	N/A

<sup>a</sup> These subsystems only include feed control system components, with the exception of the boiler, which only includes the steam control system for the dryer. No substitution of terms as referenced in Permit Conditions II.G.2.e. and V. are to be made in this Permit for these subsystems.

\* No substitution of terms as referenced in Permit Conditions II.G.2.e. and V. are to be made in this Permit for these subsystems.

N/A means no secondary containment required

**TABLE V.2. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) -PHASE 1 SECONDARY CONTAINMENT SYSTEMS INCLUDING SUMPS AND FLOOR DRAINS**

Sump/Floor Drain I.D. No. & Room Location	Maximum Sump Capacity (gallons)	Sump Dimensions (feet) & Materials of Construction	Engineering Description (Drawing No., Specification No., etc.)
RESERVED	RESERVED	RESERVED	RESERVED

**TABLE V.3. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) -PHASE 1 PROCESS AND LEAK DETECTION SYSTEM INSTRUMENTS AND PARAMETERS**

Sub-system Locator and Name (including P&ID)	Control Parameter	Type of Measuring or Leak Detection Instrument	Location of Measuring Instrument (Tag No.)	Instrument Range	Failure State	Expected Range	Instrument Accuracy	Instrument Calibration Method No. and Range
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED

**TABLE V.4. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) - PHASE 2 DESCRIPTION FOR NON-MAJOR COMPONENTS (E.G., PUMPS, FILTERS, FANS, COMPRESSORS, ETC NOT SPECIFICALLY LISTED)**

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Control system for feed from the Waste & Simulant Staging Tanks to Waste Dryer <sup>a*</sup> (Waste Transfer Pump Skid)	32-D58-007	RESERVED	Sections 2.3.2, 2.3.3, 4.2, 4.2.1, 4.2.2.1, 4.2.3, 4.2.4, 4.2.12, 4.2.17; Table 4-1; Figures 2-2, B-1, and B-4	N/A
Waste Dryer including:  Dust Recycle Feed to Dryer <sup>a</sup>	33-D25-006  00-A-0016	RESERVED  RESERVED	Sections 2.3.3, 4.2, 4.2.1, 4.2.8, 4.2.12, 4.2.14, 4.2.15, 4.2.17; Tables 4-1, 4-5; Figures 2-2, B-1, B-2, B-4, and B-5	2645  NA

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Waste Drying System including:  Control system for clean soil feed to dryer <sup>a*</sup>  The waste dryer steam supply control system <sup>a*</sup>	33-D58-068	RESERVED	Sections 2.3.3, 4.2, 4.2.1, 4.2.8, 4.2.12, 4.2.14, 4.2.15, 4.2.17; Tables 4-1, 4-5; Figures 2-2, B-1, and B-4	N/A
<b>DRYER OFFGAS TREATMENT SYSTEM</b>				
Dryer Offgas Condenser including:  Condenser chilled water feed control system <sup>a*</sup>	33-D10-005	RESERVED	Sections 4.2.14, 4.2.17; Tables 4-2, 4-3, 4-5; Figures 2-2, B-1, and B-4	NA
<b>ICV® STATIONS</b>				
Vitrification Container Preparation*	RESERVED	RESERVED	Sections 4.2.9, 4.2.17; Tables 4-1, 4-5; Figures 2-2 and B-1	N/A
ICV® System (Container Waste Fill, ICV® Melt & Vented Cooling) including:  Dry waste feed control system <sup>a</sup>	RESERVED	RESERVED	Section 2.2.1, 4.2.11, 4.2.12, 4.2.17; Table 4-1; Figures 2-2, B-1, and B-4	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Top-Off, and Container Sealing including:  Top-off soil feed control system <sup>a*</sup>	RESERVED	RESERVED	Section 2.2.1, 4.2.11, 4.2.12, 4.2.17; Table 4-1; Figures 2-2, B-1, and B-4	N/A
Transport to Storage Pad (Sample Point)*	RESERVED	RESERVED	Section 2.2.1, 4.2.11; Figures 2-2, B-1, and B-4	N/A
<b>MAIN OFFGAS TREATMENT SYSTEM</b>				
Sintered Metal Filter #1	36-N02-019	RESERVED	Sections 4.2.12, 4.2.15, 4.2.17; Table 4-2; Figures B-2 and B-5	N/A
Sintered Metal Filter #2	36-N02-020	RESERVED	Sections 4.2.12, 4.2.15, 4.2.17; Table 4-2; Figures B-2 and B-5	N/A
<b>Venturi Scrubber System (VSS)-1</b> Quencher #1	36-N83-034	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17; Tables 4-1, 4-3; Figures B-2 and B-5	RESERVED
<b>VSS-1</b> Scrubber Feed System Tank #1 <sup>a*</sup> includes:  Caustic make-up feed control system <sup>a*</sup>	36-D74-052	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17; Table 4-5; Figures B-2 and B-5	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
<b>VSS-1</b> Heat Exchanger #1 includes:  Chilled water feed control system <sup>a*</sup>	36-D30-046	RESERVED	Figures B-2 and B-5	RESERVED
<b>VSS -1</b> Scrubber #1	36-N73-035	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17; Tables 4-1, 4-2, 4-4, 4-5; Figures B-2 and B-5	RESERVED
<b>VSS-1</b> Mist Eliminator #1	36-N24-036	RESERVED	Sections 4.2.15, 4.2.17; Tables 4-1, 4-2, 4-3; Figures B-2 and B-5	N/A
<b>Venturi Scrubber System (VSS)-2</b> Quencher #2	36-N83-037	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17; Tables 4-1, 4-2, 4-3; Figures B-2 and B-5	RESERVED
<b>VSS-2</b> Scrubber Tank Feed System #2 <sup>a*</sup> includes:  Caustic make-up feed control system <sup>a*</sup>	36-D74-054	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17; Table 4-5; Figures B-2 and B-5	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
<b>VSS-2</b> Heat Exchanger #2 includes: Chilled water feed control system <sup>a*</sup>	36-D30-047	RESERVED	Figures B-2 and B-5	RESERVED
<b>VSS-2</b> Scrubber #2	36-N73-038	RESERVED	Sections 4.2.4, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-4, 4-5; Figures B-2 and B-5	RESERVED
<b>VSS-2</b> Mist Eliminator #2	36-N24-039	RESERVED	Sections 4.2.15, 4.2.17; Figures B-2 and B-5	N/A
Scrubber Condenser	36-D10-040	RESERVED	Figures B-2 and B-5	N/A
Mist Eliminator #3	36-N24-041	RESERVED	Figures B-2 and B-5	N/A
HEPA Filter Heater*	36-N84-042	RESERVED	Sections 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-2, 4-3, 4-5, 4-6; Figures 2-2 and B-2	N/A
HEPA Filters #1 #2 #3	36-N02-043 36-N02-044 36-N02-045	RESERVED RESERVED RESERVED	Sections 4.2.12, 4.2.15, 4.2.17; Tables 4-2, 4-6; Figures B-2 and B-5	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Carbon Filter	36-NO2-064	RESERVED	Sections 4.2.12, 4.2.15, 4.2.17, 4.3.3; Tables 4-2, 4-6; Figures 2-2, B-2, and B-5	N/A
Offgas Polishing Filter	36-NO2-79	RESERVED	Figures 2-2 and B-3	N/A
Tri-Mer Quencher includes:  Water feed control system <sup>a*</sup>	36-N83-068	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer OX1 Tower including:  H <sub>2</sub> SO <sub>4</sub> feed control system <sup>a*</sup>  NaClO <sub>2</sub> feed control system <sup>a*</sup>	36-D77-069	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer RC1 Tower & RC1 Tower Sump including:  Na <sub>2</sub> S feed control system <sup>a*</sup>  NaOH feed control system <sup>a*</sup>	36-D77-070 36-D74-074	RESERVED RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
Tri-Mer OX2 Tower including: H <sub>2</sub> SO <sub>4</sub> feed control system <sup>a*</sup> NaClO <sub>2</sub> feed control system <sup>a*</sup>	36-D77-071	RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer RC2 Tower & RC2 Tower Sump including: Na <sub>2</sub> S feed control system <sup>a*</sup> NaOH feed control system <sup>a*</sup>	36-D77-072 36-D74-075	RESERVED RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
Tri-Mer CC Tower & CC Tower Sump including: NaOH feed control system <sup>a*</sup>	36-D77-073 36-D74-076	RESERVED RESERVED	Sections 4.2.4, 4.2.6, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5; Figures 2-2, B-3, and B-6	RESERVED
SCR Heater*	36-N84-078	RESERVED	Sections 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5, 4-6; Figures 2-2, B-3, B-6	N/A

Sub-system Description	Sub-system Designation	Engineering Description (Drawing No., Specification No., etc.)	Narrative Description, Tables and Figures	Maximum Capacity (gallons)
SCR Catalyst Bed including: Ammonia feed control system <sup>a*</sup>	36-D59-003	RESERVED	Sections 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5, 4-6; Figures 2-2, B-3, and B-6	N/A
SCR Heat Exchanger*	36-D30-077	RESERVED	Sections 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.15, 4.2.17, 4.3; Tables 4-1, 4-2, 4-5, 4-6; Figures 2-2, B-3, and B-6	N/A
Ammonia scrubber including: Dilute H <sub>2</sub> SO <sub>4</sub> feed control system <sup>a*</sup>	RESERVED	RESERVED	Figures B-3 and B-6	N/A
Offgas Exhaust Stack*	36-N26-024	RESERVED	Section 4.2.12, 4.2.17; Figures 2-2, B-3, and B-6	N/A

<sup>a</sup> These subsystems only include feed control system components, with the exception of the boiler, which only includes the steam control system for the dryer. No substitution of terms as referenced in Permit Conditions II.G.2.e. and V. are to be made in this Permit for these subsystems.

\* No substitution of terms as referenced in Permit Conditions II.G.2.e. and V. are to be made in this Permit for these subsystems.

N/A means no secondary containment required

**TABLE V.5. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) – PHASE 2 SECONDARY CONTAINMENT SYSTEMS INCLUDING SUMPS AND FLOOR DRAINS**

Sump/Floor Drain I.D. No. & Room Location	Maximum Sump Capacity (gallons)	Sump Dimensions (feet) & Materials of Construction	Engineering Description (Drawing No., Specification No., etc.)
RESERVED	RESERVED	RESERVED	RESERVED

**TABLE V.6. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) – PHASE 2 PROCESS AND LEAK DETECTION SYSTEM INSTRUMENTS AND PARAMETERS**

Sub-system Locator and Name (including P&ID)	Control Parameter	Type of Measuring or Leak Detection Instrument	Location of Measuring Instrument (Tag No.)	Instrument Range	Failure State	Expected Range	Instrument Accuracy	Instrument Calibration Method No. and Range
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED

**TABLE V.7. – MAXIMUM FEED AND FEED-RATES TO DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS) – PHASE 1 AND 2**

Description of Waste	Phase 1	Phase 2
<b>Tank 241-S-109 Waste</b>	1080 gallons	300,000 gallons
<b># of ICV® Container Loads</b>	3	50 minus number of ICV® Container Loads processed during Phase 1
Dryer Feed (pounds/hour)	RESERVED	RESERVED
Mixed Waste	RESERVED	RESERVED
Simulant Dangerous Waste	RESERVED	RESERVED
Simulant Non-Dangerous Waste	RESERVED	RESERVED
Soil	RESERVED	RESERVED
ICV® Feed (pounds/hour)	RESERVED	RESERVED
Mixed Waste	RESERVED	RESERVED
Simulant Dangerous Waste	RESERVED	RESERVED

Description of Waste	Phase 1	Phase 2
Simulant Non-Dangerous Waste Soil	RESERVED RESERVED	RESERVED RESERVED
Dryer Feed (pounds/hour)		
Total Chlorine/Chloride Feed-rate	RESERVED	RESERVED
Total Metal Feed-rates		
Arsenic	RESERVED	RESERVED
Cadmium	RESERVED	RESERVED
Chromium (total)	RESERVED	RESERVED
Lead	RESERVED	RESERVED
Mercury	RESERVED	RESERVED
Beryllium	RESERVED	RESERVED
Total Organics (Organic Compounds listed on Table 6-1 of Attachment BB of this Permit.	RESERVED	RESERVED

**TABLE V.8. – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS)  
EMERGENCY PARAMETER CONTROL / RESPONSE SYSTEM (RESERVED)**

Sub-system Designation	Instrument or Component Tag Number	Parameter Description	Setpoints Limits During Phase 1	Setpoints Limits During Phase 2 Campaign No.	Respond to Deviation from setpoint*
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED

\*(e.g., automatically cut-off and/or lock-out the dangerous and mixed waste feed to the DBVS, etc.)

### **PART VI – FACILITY SUBMITTAL SCHEDULE**

Any procedure, method, data, or information contained in this document that relates solely to radionuclides or to the radioactive source, byproduct material, and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954, as amended) is not provided for the purpose of regulating the radiation hazards of such components under the authority of this Permit and Chapter 70.105 RCW.

**TABLE VI.1. – REQUIRED SUBMITTALS AND COMPLIANCE SCHEDULE**

Reference	Required Submission	Date or Event
<b>PART II – GENERAL FACILITY CONDITIONS</b>		
I.E.9.	The Permittees may not commence treatment or storage of dangerous and/or mixed waste in any new or modified portion of the facility, until the requirements of I.E.9.a. through I.E.9.a.ii. have been met.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.B.7.	The Permittees shall submit to Ecology the revised pages of Permit Attachment BB reflecting the amendments in II.B.7.a. through II.B.7.y. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.B.8.	The Permittees shall submit and receive written approval from Ecology for Permit Attachment BB revisions reflected in II.B.8.a. through II.B.8.c.i. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.B.8.d.	The Permittees shall submit to Ecology for approval and strictly for this RD&D Permit, documentation, not based solely on process knowledge that shows the removal of the characteristic code D001 and D003 from S-109 tank waste.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.

Reference	Required Submission	Date or Event
II.B.9.	The Permittees shall submit Section 2 of Permit Attachment AA amended as described in II.B.9.a. through II.B.9.c. specified "for information only."	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.C.6.	The Permittees shall submit and receive written approval from Ecology for Permit Attachment FF, revisions reflected in II.C.6.a. through II.C.6.a.viii. of this Permit, with the exception of II.C.1.a.viii. A., which will be incorporated into the Permit Administrative Record.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.D.2.	The Permittees shall update and resubmit and receive written approval from Ecology for the Inspection Schedule in Permit Attachment II. The revised schedule shall include, but not be limited to, II.D.2.a. through II.D.2.c. of this Permit. In addition, the Permittees shall submit to Ecology for incorporation into the Administrative Record, the basis for developing Inspection Schedule frequencies.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.E.3.	The Permittees shall update and resubmit and receive approval from Ecology for the Training Program description in Permit Attachment CC. The revised Training Program description shall include, but not be limited to, the information requested in II.E.3.a. through II.E.3.b. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility units.
II.F.4.	The Permittee shall submit the revised page to Ecology reflecting the amendment in II.F.4. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste.
II.F.5.	The Permittees shall update and resubmit and receive written approval from Ecology of Permit Attachment DD to be consistent with design details and schedule described in Parts III, IV, and V and Attachments JJ, KK, and LL of this Permit.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.

Reference	Required Submission	Date or Event
II.F.6.	The Permittees shall review and amend, if necessary, the applicable portions of the Contingency Plan, Permit Attachment DD, in accordance with the provisions of WAC 173-303-350(5) and WAC 173-303-830(4). The amended Contingency Plan shall be submitted to Ecology as a Permit Modification pursuant to Permit Conditions I.C.2. and I.C.3.	After initial receipt of dangerous and/or mixed waste.
II.F.7.	The Permittees shall revise, resubmit, and receive written approval from Ecology of Permit Attachment DD to include the information in II.F.7.a. and II.F.7.b. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.G.2.b.vii.	Generator Report – Form 4 as required in WAC 173-303-220(1).	Annually, after initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.G.2.b.viii.	TSD Facility Report – Form 5 in compliance with WAC 173-303-390(2).	Annually, after initial receipt of dangerous and/or mixed waste in the DBVS Facility.
II.H.2.	The Permittees shall submit and receive written approval from Ecology, for any update to the Closure Plan, Attachment EE.	Prior to commencing partial closure.
II.H.3.	The Permittees shall submit and receive written approval from Ecology for a Sampling and Analysis Plan and a revised Closure Plan.	Prior to commencing final closure.
II.H.6.	The Permittees are required to furnish documentation supporting the independent registered professional engineer's certification to Ecology upon request, until Ecology has notified the Permittees in writing that Ecology agrees with and has accepted the Permittees' closure certification. The closure documentation must include at a minimum the information contained in II.H.6.a. through II.H.6.h. of this Permit.	After closure activities have been completed.

Reference	Required Submission	Date or Event
II.H.9.	The Permittees shall update and resubmit and receive written approval from Ecology for the Closure Plan, Permit Attachment EE, to be consistent with design details and schedule described in Permit Attachments JJ, KK, and LL. The updated Closure Plan, Permit Attachment EE, must be consistent with the closure performance standards specified in WAC 173-303-610(2).	Prior to initial receipt of dangerous and/or mixed waste in DBVS Facility.
II.H.10.	The Permittee shall submit the revised page reflecting the amendment in II.H.10. of this Permit to Ecology.	Prior to initial receipt of dangerous and/or mixed waste in DBVS Facility.
II.I.	The Permittees must submit documentation of a substitution of an equivalent or superior equipment, materials and/or administrative information, accompanied by a narrative explanation and the date the substitution became effective.	Place in the operating record and submit to Ecology within seven days of putting the substitution into effect.
PART III – CONTAINER MANAGEMENT PRACTICES		
III.G.2.	The Permittees shall submit and receive written approval from Ecology for engineering information as specified in III.G.2.a. of this Permit for incorporation into Attachment JJ.	Prior to construction of the DBVS Facility container storage area.
III.G.3.	The Permittees shall submit and receive written approval from Ecology for Permit Table III.1. updated to include the contents of Column 2 "Engineering Description," to reflect the engineering information provided under III.G.2.a. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste to the DBVS Facility.

Reference	Required Submission	Date or Event
SECTION IV – TANK SYSTEMS		
IV.A.8.b.	The Permittees shall submit and receive approval from Ecology for the engineering information as specified in IV.A.8.b.i. through IV.A.8.b.viii. of this Permit for incorporation into Permit Attachment KK.	Prior to construction of each DBVS Facility Tank System.
IV.A.8.c.	The Permittees shall submit and receive approval from Ecology for the engineering information specified in IV.A.8.c.i. through IV.A.8.c.v. for incorporation into Permit Attachment KK.	Prior to installation of ancillary equipment for each DBVS Facility Tank System.
IV.A.8.d.	The Permittees shall submit and receive Ecology approval for incorporation, into Permit Attachment KK, the information specified in IV.A.8.d.i. through IV.A.8.d.vii. of this Permit. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions IV.A.8.b. and IV.A.8.c.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility Tank Systems.
IV.A.8.e.	The Permittees shall submit and receive Ecology approval as specified in IV.A.8.e.i. through IV.A.8.e.iii. for incorporation into this Permit. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions IV.A.8.b. through IV.A.8.d.	Prior to initial receipt of dangerous and/or mixed waste into the DBVS Facility Tank Systems.
IV.A.8.f.	The Permittees shall submit the revised pages as specified in IV.A.8.f.i. through IV.A.8.f.iii. of this Permit to Ecology.	Prior to installation of the DBVS Tank System as identified in Permit Table IV.1.

Reference	Required Submission	Date or Event
SECTION V – DEMONSTRATION BULK VITRIFICATION SYSTEM (DBVS)		
V.A.1.z.	Changes to approved design, plans, and projected performance documentation in Permit Attachment LL for the DBVS shall require that the Permittee submit and receive written approval from Ecology, except as specified in Permit Conditions II.A.8., II.A.9., or II.I.	As needed.
V.H.3.	The Permittees shall not commence Phase 1 until the Permittees have submitted and received Ecology approval for the Phase 1 DBVS Campaign Plan pursuant to Permit Condition V.I.6.	Prior to start of Phase 1.
V.H.4.	The Permittees shall not commence the first campaign under Phase 2 until the requirements in V.H.4.a. through V.H.4.b. of this Permit have been met.	Prior to start of Phase 2.
V.H.5.	The Permittees shall not commence each subsequent campaign under Phase 2 until the actions listed in V.H.5.a. through V.H.5.b. have occurred.	Before commencing each subsequent campaign under Phase 2.
V.I.2.	The Permittee shall submit and receive Ecology approval for the engineering information as specified in V.I.2.a. through V.I.2.f. for incorporation into Permit Attachment LL.	Prior to construction of each secondary containment and leak detection system for the DBVS as identified in Permit Tables V.2. and V.5.
V.I.3.	The Permittee shall submit and receive approval from Ecology for the engineering information as specified in V.I.3.a. through V.I.3.e. of this Permit for incorporation into Permit Attachment LL.	Prior to installation of each sub-system as identified in Permit Tables V.1. and V.4.
V.I.4.	The Permittee shall submit and receive Ecology approval as specified in V.I.4.a. through V.I.4.r. of this Permit for incorporation into Permit Attachment LL. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions V.I.2. and V.I.3., as approved by Ecology.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.

Reference	Required Submission	Date or Event
V.I.5.	The Permittees shall submit and receive Ecology approval as specified in V.I.5.a. through V.I.5.c. for incorporation into this Permit. All information provided under this permit condition must be consistent with information provided pursuant to Permit Conditions V.I.2., V.I.3., and V.I.4., as approved by Ecology.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
V.I.6.	The Permittee shall submit and receive approval from Ecology for the Phase 1 DBVS Campaign Plan. The Phase 1 DBVS Campaign Plan shall include the information specified in Sections 5 and Appendix A of Permit Attachment LL in addition to V.I.6.a. through V.I.6.i. of this Permit.	Prior to initial receipt of dangerous and/or mixed waste in the DBVS Facility.
V.I.7.	The Permittees shall submit and receive approval from Ecology for the Phase 2 DBVS Campaign Plan, except as specified in Permit Condition V.I.8. The Phase 2 DBVS Campaign Plan shall include the information specified in Permit Condition V.I.6. In addition, the Phase 2 DBVS Campaign Plans designed to provide "Feed Envelope Verification and/or Process Improvement," shall include the information required in V.I.7.a. through V.I.7.b. of this Permit.	Prior to commencement of the Phase 2 DBVS Campaign and prior to commencement of each Phase 2 DBVS Campaign.
V.I.9.	The Permittees shall submit to Ecology the Final DBVS Campaign Report that includes information listed in V.I.9.a. through V.I.9.e.iv. of this Permit.	Within ninety (90) days after the completion of the final campaign.
V.I.10.	The Permittees shall submit to Ecology a draft DBVS Campaign Summary Report that includes the information specified in V.I.9.b. through V.I.9.e. and V.I.10.a. through V.I.10.c. of this Permit.	Within 120 days after the completion of the final DBVS Campaign Summary Report specified in V.I.9.

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# **PERMIT ATTACHMENT AA**

**Facility Description – Section 2 of the Permit Application**

**Permit Number: WA 7890008967**

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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## **2.0 FACILITY DESCRIPTION**

### **2.1 FACILITY SITING**

The planned site location for the Test and Demonstration Facility is shown in Figure 2-1. The site is located immediately west of the 241-S Tank Farm in the 200 West Area of the Hanford Site. The wastes planned for treatment are currently stored in Tank 241-S-109; a 2,839,050-L (750,000-gal) SST located in the 200 West Area. The waste from Tank 241-S-109 will be transferred to a waste staging tank and/or waste receipt tank(s) at the planned Test and Demonstration Facility location after pretreatment.

The site is west of the existing 241-S Tank Farm fence in an already disturbed area and will support process and ancillary equipment for the DBVS. The proposed location allows close access to existing electrical and raw water utilities, telephone, and Hanford local area network services. Surface materials consist of soft sand and soil that are free from surface contamination. The site is sufficiently level to provide for equipment placement with minimum grading or excavation. Cooper Avenue, running north-south on the west side of the 241-S Tank Farm, provides ingress and egress to the area.

### **2.2 PHYSICAL PLANT**

The Test and Demonstration Facility (Figures 2-2 and 2-3) will make use of existing infrastructure to the maximum extent possible. Because of the unit-specific installation, operational, and closure needs of the DBVS, some infrastructure elements may be modified, augmented, or added. Potential infrastructure elements include:

- Utilities (water, electric power, sewer, steam)
- Communications (telephone and computer)
- Roadways
- Radioactive material containment
- Hazardous material containment
- Secondary waste storage/transfer systems
- Treated waste storage/transfer systems.

Facility security provisions and signage will comply with applicable portions of WAC 173-303-310.

#### **2.2.1 Bulk Vitrification System Components**

The DBVS consists of trailer-mounted and skid-mounted equipment suitable for field installation, operation, and removal at the completion of the project. The system includes the major components, systems, and areas listed below, which are described in detail in Section 4.0.

The general arrangement of the following components for Phase 1 and for Phase 2 (Figures 2-2 and 2-3) includes:

- Waste retrieval system
- Waste staging tank and pumps
- Waste receipt tanks and pumps
- Process additive storage/handling
- Waste feed preparation (mixer/dryer)
- Vitrification container preparation system
- In-container vitrification (ICV<sup>®</sup>) system
- Electrical equipment
- Offgas treatment system
- Control and data acquisition system
- ILAW storage
- Secondary waste storage and handling (containers or tanks).

### **2.2.2 Support Systems**

Support systems are systems that are required to operate the DBVS, but are not directly involved with the process. The support systems consist of:

- Control station
- Personnel contamination control and survey station
- Personnel rest areas (e.g., lunch room and restrooms)
- Change room
- Safety showers and eye wash stations
- Backup generator.

## **2.3 WASTE CHARACTERISTICS, RETRIEVAL/STORAGE, AND TRANSFER**

### **2.3.1 Waste Characteristics**

The waste in Tank 241-S-109 is stratified. In the bottom of the tank is a layer of sludge. On top of the sludge is a mixed saltcake solid and liquid layer and the top layer is drained saltcake. The salt cake waste is the source waste material for the Test and Demonstration Facility. Some characterization of the waste in Tank 241-S-109 was previously conducted. Characterization results represent the Best Basis Inventory (BBI) for the liquid and saltcake fraction of the tank waste. A detailed discussion of the waste characteristics is located in Section 6.2.

### 2.3.2 Waste Retrieval and Storage

The retrieval detail for Tank 241-S-109 is presented in RPP-18812, *Tank S-109 Partial Retrieval Functions and Requirements*, and has been submitted to Ecology for approval of the retrieval process.

There will be a difference in the retrieval of waste from Tank 241-S-109 and its transfer to the DBVS between Phases 1 and 2 of the program. During Phase 1, waste from Tank S-109 will be routed through a solids/liquid hydroclone separator and sensing instruments to a staging tank that will hold 3,780 L (1,000 gal) of material (Figure 2-4). The sensing instruments will provide process control or waste characterization information. Staging tank discharge will be pumped to either a DBVS waste receipt tank or, if not suitable for processing in the DBVS, to the DST system.

During Phase 2 the waste will be transferred directly to the waste receipt tanks. The transfer route will go through the solids/liquid hydroclone separator and sensing instrumentation, but bypass the 3,780 L (1,000 gal) waste staging tank (Figure 2-4).

The Test and Demonstration Facility will accept tank waste into waste receipt tanks with capacities shown in Table 2-1.

**Table 2-1. Waste Receipt Tank Capacity**

Phase	Number of Tanks	Capacity	Total Capacity
1	1	3,780 L (1,000 gal)	3,780 L (1,000 gal)
2	4	68,140 L (18,000 gal)	272,160 L (72,000 gal)

All waste storage tanks and containers including the waste staging tank and waste receipt tanks will be properly and legibly marked in accordance with the requirements of WAC 173-303-395(6). Containers will be managed in accordance with the requirements of WAC 173-303-630. All waste tank systems will comply with the design, installation, and operating requirements of WAC 173-303-640, as applicable. Tank system materials of construction will be selected with appropriate consideration for the corrosion potential of the materials stored and process conditions.

Secondary containment will be provided for all tanks in the form of double-walled tankage or containment structures with sumps. Containment provisions will be designed and constructed for compliance with WAC 173-303-640(4).

During Phase 1, the waste staging tank and waste receipt tank will be double shell tanks or placed in containment structures with sumps (Figures 2-2 and 2-3). For Phase 2, the waste staging tank will be bypassed but will either remain in its structure or be removed and decontaminated in compliance with the Test and Demonstration Facility closure plan (Section 11.0).

### 2.3.3 Waste Transfer

Waste transfer will be in the form of waterborne salt solution. Waste left in a waste receipt tank at the end of a campaign may be transferred to another tank and mixed with incoming waste for processing. A waste transfer line water flush may be made after each batch transfer of waste feed, as needed. Waste transfer will occur only after verification that all systems are ready for the transfer/receipt of waste. The vitrification station will be located beneath the dried waste hoppers for gravity feed of waste to the container. The mixer/dryer, vitrification, cooldown, and tophoff/survey stations will be provided with radiation shielding and spill containment curbs.

Secondary containment will be provided for liquid waste transfer operations in the form of hose-in-hose or pipe-in-pipe transfer lines. Dried waste transfer from the mixer/dryer to the hopper will have secondary containment. Dried waste transfer from the hopper to the container will be conducted inside a removable hood sealed to the container top. Cleanup of spills within the hood will be performed using a containment system.

## 2.4 TREATED WASTE PACKAGING

Containers of treated waste resulting from the bulk vitrification process will be placed in a dedicated temporary storage area at the Test and Demonstration Facility site (Figure 2-2) during the RD&D permit duration. By generating immobilized treated waste directly in the container, the treatment container also serves as the final disposal container. The storage area will be designed to hold all containers of treated waste generated during the project. The storage area will meet the provisions of WAC 173-303-630(7)(c)(i) and (ii) which are applicable for storage areas that store containers holding only wastes that do not contain free liquids (i.e., the bulk vitrification waste containers):

- (i) *The storage area is sloped or otherwise designed and operated to drain and remove liquid resulting from precipitation; or*
- (ii) *The containers are elevated or are otherwise protected from contact with accumulated liquids.*

All containers, handling procedures, and handling equipment will meet the waste acceptance criteria of the accepting disposal facility. Final disposal of treated waste will be at a permitted Hanford Site facility.

## 2.5 NON-REGULATED MATERIALS/SYSTEMS

Information provided in the following sections is general in nature and represents the minimum considerations for handling of non-regulated materials. Management of specific materials related to DBVS operation is discussed in Section 4.0.

### 2.5.1 Potable Water

Water for process use will be transported by tanker truck to the Test and Demonstration Facility. The water source will provide settled river water or potable water. Backflow prevention will be provided to prevent the backflow of potable water to the tanker truck by utilizing an air gap as

1 the backflow mechanism, or other approved backflow prevention device, as applicable.  
2 Backflow prevention devices will be Washington State-certified models accessible for inspection  
3 by a water purveyor in a non-radiological zone.

4 Administrative and engineering controls (e.g., scheduled inspections, containment pads and  
5 curbs) will be in place to avoid spillage of water (which could potentially result in the  
6 mobilization of contaminants in the vadose zone).

## 7 **2.5.2 Raw Materials, Process Additives, and Consumables**

8 Raw materials, process additives, and other consumable materials will be stored in tanks,  
9 containers, or bulk storage in the Test and Demonstration Facility (Figure 2-2). Storage and  
10 delivery systems will be designed to accommodate the ingress and egress of trucks delivering  
11 raw materials and consumables. This accommodation may be composed of docks or stockpiles  
12 that allow for ease of loading/off-loading of the materials and consumables. Soil storage may be  
13 provided by a hopper truck with pneumatic conveying of soil to the DBVS during both phases.  
14 For Phase 2, a soil stockpile may be used in lieu of the hopper truck due to the higher usage rate  
15 of soil. Refractory sand will be stored in a stockpile for both phases. Other process additives  
16 will be stored in containers. The design and location of the loading/off-loading areas will be  
17 compatible with existing Hanford Site roadways and/or other roadways added for the planned  
18 Test and Demonstration Facility.

## 19 **2.5.3 Electric Power System**

20 Under normal operating conditions, all electric power for the Test and Demonstration Facility  
21 will be obtained from the Hanford Site grid through a local transformer. A backup generator will  
22 be located at the site to provide power in the event grid power is lost. The backup generator will  
23 have about a 1,200-kilowatt total load rating. The generator will be diesel-powered. A 37,850-L  
24 (10,000-gal) diesel fuel storage tank will be provided for the generator drive motor.

25 The backup generator is capable of powering the Test and Demonstration Facility systems with  
26 480 volt loads on a continuous basis. However, it will be intended only for use in continuous  
27 operation of the offgas treatment system, system pumps, the control system, and other  
28 electrically-operated equipment needed for a controlled system shutdown in the event of a power  
29 outage and achieving full system shutdown until power from the Hanford Site grid can be  
30 restored.

## 31 **2.6 SECONDARY WASTES**

32 A variety of secondary wastes may be generated during the planned project. This section covers  
33 general requirements for management of expected secondary wastes. Details are provided in  
34 Section 4.0.

35 Secondary waste streams such as liquid effluent will be disposed of in the Liquid Effluent  
36 Retention Facility, the Effluent Treatment Facility (ETF), or the 200 Area Treated Effluent  
37 Disposal Facility, as appropriate. Disposition of solid waste streams will be managed in  
38 accordance with HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, and the waste

acceptance criteria of the receiving facility, as necessary. Disposition of secondary liquid effluent waste streams will be managed in accordance with HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*, and the acceptance criteria of the receiving facility, as necessary.

Dedicated tanks will be provided for onsite liquid waste storage pending sampling and transfer to a treatment facility. It is anticipated that up to ten 68,140L (18,000 gal) tanks may be used. The actual capacity and number of tanks will be determined during the DBVS project. Tank systems will comply with the applicable portions of WAC 173-303-640.

Storage tank capacity requirements are based on the following assumptions:

- Dryer condensate =  $3.40 \text{ gpm} \times 60 \text{ min/hr} \times 7.9 \text{ hr/dryer batch} \times 8 \text{ dryer batches} \approx 12,900 \text{ gal}$
- Quench blowdown =  $2.39 \text{ gpm} \times 60 \text{ min/hr} \times 168 \text{ hr/ICV batch} \approx 24,100 \text{ gal}$
- Tri-Mer Scrubber blowdown<sup>1</sup> =  $4.29 \text{ gpm} \times 60 \text{ min/hr} \times 200 \text{ hr/ICV batch} \approx 51,500 \text{ gal}$
- Total flow to ETF per ICV container  $\approx 88,500 \text{ gal per container}$ .

Offgas treatment system equipment designs will comply with the applicable requirements of WAC 173-400, 173-401, 173-460, WAC 246-247, and ASME AG-1, *Code on Nuclear Air and Gas Treatment*. The design of the gaseous and particulate effluent monitoring system will comply with ANSI/HPS N13.1, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*. The process equipment will interface with systems that transport secondary waste to appropriate locations.

## 2.7 IGNITABLE, REACTIVE, AND/OR INCOMPATIBLE MATERIALS

In the course of the RD&D project, it is unlikely that tank waste batches will be received that are incompatible with other materials present in the facility, especially process additives. DOE has identified flammable/toxic gases as a potential waste incompatibility. Incompatibilities will be addressed in DOE safety documentation to comply with WAC 173-303-395. Process knowledge, process history, pertinent literature on waste chemistry and tank history and waste analysis will be used to address the Dangerous Waste Codes D001 (Ignitability), D002 (Corrosivity), and D003 (Reactivity) for the waste before transfer to the Test and Demonstration Facility. Verification sampling to document the absence of characteristic codes will be performed on the first batch of retrieved waste as part of the WRS prior to transfer to the DBVS waste receipt tank.

## 2.8 OCCUPATIONAL SAFETY AND HEALTH

All buildings, structures, and equipment utilized in the planned project will incorporate design features that comply with applicable subparts of Occupational Safety and Health Administration (OSHA) Regulation 29 CFR 1910, "Occupational Safety and Health Standards."

<sup>1</sup> Only if used as a backup to the SCR.

# **PERMIT ATTACHMENT BB**

**Waste Analysis Plan – Section 6 of the Permit  
Application;  
and  
Analytical Methods – Appendix D of the Permit  
Application**

**Permit Number: WA 7890008967**

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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# **Waste Analysis Plan – Section 6 of the Permit Application**

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## **6.0 WASTE ANALYSIS PLAN**

### **6.1 GENERAL**

The Waste Analysis Plan (WAP) provides the basis for measuring the adequacy of waste treatment and assists in optimizing the waste treatment operation based on treated waste analysis results. It also provides information on secondary waste streams to determine the required type and level of treatment or the appropriate disposal path.

The WAP objective is to develop a sampling approach for the final vitrified waste form to ensure compliance with the waste acceptance criteria of the IDF or another permitted disposal facility and the land disposal restrictions listed in WAC 173-303-140. As depicted in Figure 6-1, the WAP identifies assumptions, sample points, sampling methods and frequencies, and analytical objectives.

### **6.2 WASTE FEED CHARACTERISTICS AND SAMPLING**

#### **6.2.1 Dangerous Waste Designations**

Tank 241-S-109 has the dangerous waste designations listed in Table 6-1, per the SST Part A Form 3 (DOE/RL-88-21).

Process knowledge, process history, pertinent literature on waste chemistry and tank history, and analysis on the waste retrieved during Phase 1 and Phase 2 will be used to address the Dangerous Waste Codes D001 (Ignitability), D002 (Corrosivity), and D003 (Reactivity) before transfer to the DBVS to ensure characteristics associated with these waste codes do not exist in the waste feed. Sections 6.2.4 and 6.2.5 discusses sampling frequency in greater detail.

#### **6.2.2 Waste Physical Properties**

The DBVS has been designed to receive waste that has the physical properties listed in Table 6-2 (RPP-17403). The waste will not contain a visible separate organic phase.

**Table 6-1. Dangerous Waste Designation and Sampling/Analysis Strategy (2 pages)**

Waste Code	Chemical/Characteristic (40 CFR 268.40)	Strategy			
		Phase 1		Phase 2	
		Waste Feed	Vitrified Waste	Waste Feed	Vitrified Waste
D001	Ignitable Characteristic Waste	√	1	2	2
D002	Corrosive Characteristic Waste	√	1	2	2
D003	Reactive Characteristic Waste	√	1	2	2
D004	Arsenic	√	√	2	3
D005	Barium	√	√	2	3
D006	Cadmium	√	√	2	3
D007	Chromium (total)	√	√	2	3
D008	Lead	√	√	2	3
D009	Mercury	√	√	2	3
D010	Selenium	√	√	2	3
D011	Silver	√	√	2	3
D018	Benzene	√	√	2	3
D019	Carbon Tetrachloride	√	√	2	3
D022	Chloroform	√	√	2	3
D028	1,2-Dichloroethane	√	√	2	3
D029	1,1-Dichloroethylene	√	√	2	3
D030	2,4-Dinitrotoluene	√	√	2	3
D033	Hexachlorobutadiene	√	√	2	3
D034	Hexachloroethane	√	√	2	3
D035	Methyl ethyl ketone	√	√	2	3
D036	Nitrobenzene	√	√	2	3
D038	Pyridine	√	√	2	3
D039	Tetrachloroethylene	√	√	2	3
D040	Trichloroethylene	√	√	2	3
D041	2,4,5-Trichlorophenol	√	√	2	3
D043	Vinyl chloride	√	√	2	3
F001 F002 F003 F004 F005	Acetone Benzene n-Butyl alcohol Carbon disulfide Carbon Tetrachloride Chlorobenzene Cresol – mixed isomers Cyclohexanone o-Dichlorobenzene Ethyl Acetate Ethyl Benzene Ethyl ether Isobutyl alcohol Methanol Methylene chloride Methyl ethyl ketone Methyl isobutyl ketone Nitrobenzene	√	√	2	3

**Table 6-1. Dangerous Waste Designation and Sampling/Analysis Strategy (2 pages)**

		Strategy			
	Pyridine Tetrachloroethylene Toluene 1,1,1-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloro-1,2,2-trifluoroethane Trichloroethylene Trichloromonofluoromethane Xylenes – mixed isomers				
WP01	Persistent Dangerous Waste	4	4	4	4
WP02	Extremely Persistent Dangerous Waste	4	4	4	4
WT01	Toxic Dangerous Waste	5	5	5	5
WT02	Extremely Toxic Dangerous Waste	5	5	5	5

<sup>1</sup> Analyze if exists in waste feed<sup>2</sup> Analyze first waste feed tank<sup>3</sup> Analyze first ten containers, then randomly<sup>4</sup> Book designate per WAC 173-303-100(6)<sup>5</sup> Book designate per WAC 173-303-100(5)**Table 6-2. Waste Feed Physical Properties**

Property	Value
Density	1.2 – 1.3 g/ml (10.0 – 10.8 lb/gal)
Viscosity	10 cP Maximum at 25 °C (77 °F)
Percent Solids	<3%

**6.2.3 Waste Feed Chemical and Radiochemical Properties****6.2.3.1 Saltcake Key Chemical and Radiological Contaminants.**

The average concentrations of major constituents important for glass performance and key contaminants in the Tank 241-S-109 saltcake waste are shown in Tables 6-3 and 6-4. The major constituents listed in Table 6-3 are important to ensure proper glass processing and good glass performance. The key contaminants indicated in Table 6-3, column 3, are important to ensure compliance with LDRs listed in 40 CFR 268 and to determine the compliance with performance assessment objectives. Concentrations have been normalized to 5 M sodium, the sodium concentration in the expected feed to the bulk vitrification process. Note that not all of these constituents will be present in the retrieval stream, since some of the solids (in particular the metals and transuranics) have very low solubility and will mostly be left in the tank or removed via a solids/liquid hydroclone separator.

**Table 6-3. Chemical Constituents/LDR Contaminants in Average  
Tank 241-S-109 Saltcake Waste**

Constituent/ Contaminant	Average Saltcake Normalized to 5 M Na <sup>1</sup> (µg/ml)	Key Contaminants Land Disposal Restriction Level)
Aluminum	1300	
Calcium	49	
Chloride	270	
Total Chromium	770	√ (0.75 mg/L TCLP)
Fluoride	110	
Iron	270	
Potassium	170	
Manganese	8	
Nickel	6	√ <sup>2</sup>
Nitrite <sup>3</sup>	3000	√ <sup>2</sup>
Nitrate <sup>3</sup>	290000	√ <sup>2</sup>
Lead	29	√ (0.75 mg/L TCLP)
Phosphate	5500	
Silica	160	
Sulfate	3700	
Total Inorganic Carbon as CO <sub>3</sub>	11000	
Total Organic Carbon	320	
Total Uranium	28	√ <sup>2</sup>

<sup>1</sup>The composition is based on the saltcake portion of the Tank 241-S-109 Best Basis Inventory (BBI 2001), normalized to 5 M Na (115000 µg/ml)

<sup>2</sup> Not listed as an LDR contaminant

<sup>3</sup> Destroyed or removed in the vitrification process

TCLP = Toxic Characteristic Leaching Procedure

**Table 6-4. Key Radionuclide Contaminants in  
Average Tank 241-S-109 Saltcake Waste**

Contaminant	Average Saltcake Normalized to 5 M Na <sup>1</sup> (μCi/ml)
TRU (total)	$3.7 \times 10^{-3}$
Cesium-137	$6.2 \times 10^0$
Strontium-90	$2.3 \times 10^0$
Technetium-99	$4.7 \times 10^{-2}$
Cobalt-60	$5.5 \times 10^{-3}$
Europium-154	$2.5 \times 10^{-2}$
Iodine-129	$9.1 \times 10^{-5}$

<sup>1</sup>The composition is based on the saltcake portion of the Tank 241-S-109 Best Basis Inventory (BBI, 2001), normalized to 5 M Na (115000 μg/ml)

#### 6.2.3.2 Expected Concentrations of Retrieved Waste Streams

The composition of the waste retrieved during different phases of RD&D operations depends on the relative amounts of interstitial liquid and the dissolution brine retrieved. The interstitial liquid is the liquid phase that currently exists in the tank and contains the highly soluble components including the bulk of the Cs-137. The composition of this liquid is constant and established by analysis of saltwell grab samples. The dissolution brine is the liquid phase formed as the solid saltcake is dissolved through the addition of water and is composed of the relatively soluble components in the salt phase. The composition of the dissolution brine is established through modeling and changes over the course of the retrieval process. The exact ratio of these liquids retrieved in the different phases is not known but an approximate composition can be established via a general understanding of the effects of dissolution on the waste.

Retrieval operations that attempt to remove cesium from Tank 241-S-109 and route it to the DST system will focus on removing the interstitial liquid. These operations will maximize removal of the liquor and minimize the addition of water that might create dissolution brine that will dilute the liquor. The interstitial liquid concentrations for any contaminant that might end up in the glass waste form (e.g., all contaminants other than NO<sub>2</sub> and NO<sub>3</sub> which are destroyed or removed during vitrification) are bounded by the concentrations in the interstitial liquid.

The Phase 1 and Phase 2 retrieval operations will obtain an acceptable feed for the DBVS. These retrieval phases will maximize the quantity of dissolution brine retrieved while minimizing the incorporation of the interstitial liquid. This strategy will minimize the concentration of all key contaminants other than NO<sub>2</sub> and NO<sub>3</sub> that are collected as the salt dissolves but are destroyed or removed during vitrification. In all cases, the contaminant concentrations of all key contaminants listed in Tables 6-3 and 6-4 (other than NO<sub>2</sub> and NO<sub>3</sub>) will be lower than those in the interstitial liquid.

**6.2.3.3 Compositions of Interstitial Liquid and Dissolution Brine.** Tables 6-5 and 6-6 show the concentrations of key constituents/contaminants that are expected for the interstitial liquid and the dissolution brine at three different points in the retrieval process. The brine and liquor have been normalized to 5 M sodium. The interstitial liquid composition is based on grab samples taken in the saltwell.

The dissolution brine compositions are based on the Environmental Simulation Program (ESP), a chemical thermodynamic model, which used the Tank 241-S-109 Best Basis Inventory (BBI 2001) as input. The contaminants F, NO<sub>3</sub>, PO<sub>4</sub>, SO<sub>4</sub>, CO<sub>3</sub>, and TOC (in the form of oxalate) are present with sodium primarily in the soluble solids fraction. Sodium nitrate (NaNO<sub>3</sub>) is the dominant solid and produces most of the solute in the dissolution brine. Because sodium phosphate, sulfate, and carbonate are present in small quantity, they are entirely dissolved early in the dissolution process, subsequently washing out of the waste. Sodium fluoride and oxalate salts are also present in small quantity, but their dissolution is effectively suppressed by the other salts until middle or late dissolution, so their concentrations rise later in the process. Contaminants that do not dissolve in water are excluded from the dissolution brine, as are contaminants that are present entirely in dissolved form in the original waste. The key contaminants excluded because the solid forms have very low solubility in water are Al, Ca, Cr(III), Fe, Mn, Ni, Pb, Si, U, TRU, Sr-90, Co-60, and Eu-154. The key contaminants excluded because they are present completely in dissolved form in the original waste are Cl, Cr(VI), K, NO<sub>2</sub>, Cs-137, Tc-99, and I-129.

#### **6.2.3.4 Waste Acceptance Criteria**

Other waste feed characteristics have a role in determining how the waste feed will be handled in the DBVS, but do not represent limiting specifications that would prevent the tank waste from being processed to generate the data necessary to determine if bulk vitrification is a viable production process. As an RD&D facility, it is important to maintain the flexibility to accept and test a wide range of feed compositions and to adequately challenge the process. Waste feed variations can be accommodated through blending of the waste with chemical simulant, adjusting waste loading, or through processing modifications. The limiting specifications for waste feed from Tank 241-S-109 to the DBVS are:

1. Cesium concentration must be less than 0.05 Ci/L (on a 7 M sodium basis),
2. The average solids concentration must be less than 3%,
3. TRU concentration must be less than 100 nCi/g.

**Table 6-5. Key Chemical Constituents/Contaminants in Interstitial Liquid and Dissolution Brine Fractions of Tank 241-S-109 Retrieval Stream**

Contaminant	In Interstitial Liquid Normalized to 5 M Na <sup>1</sup> (µg/ml)	In Dissolution Brine at 5 M Na (µg/ml)		
		During Early Dissolution	During Middle Dissolution	During Late Dissolution
Al	24000	Low Sol	Low Sol	Low Sol
Ca	25	Low Sol	Low Sol	Low Sol
Cl	5000	In Interstitial Liquid	In Interstitial Liquid	In Interstitial Liquid
total Cr	4700	Cr III Low Sol Cr VI in Interstitial Liquid	Cr III Low Sol Cr VI in Interstitial Liquid	Cr III Low Sol Cr VI in Interstitial Liquid
F	39	75	280	21
Fe	15	Low Sol	Low Sol	Low Sol
K	1200	In Interstitial Liquid	In Interstitial Liquid	In Interstitial Liquid
Mn	3	Low Sol	Low Sol	Low Sol
Ni	4	Low Sol	Low Sol	Low Sol
NO <sub>2</sub>	45000	In Interstitial Liquid	In Interstitial Liquid	In Interstitial Liquid
NO <sub>3</sub>	69000	186000	281000	301000
Pb	21	Low Sol	Low Sol	Low Sol
PO <sub>4</sub>	840	17000	3200	1100
Si	71	Low Sol	Low Sol	Low Sol
SO <sub>4</sub>	900	8000	5400	750
TIC as CO <sub>3</sub>	5100	34000	6200	2100
TOC	580	38	99	120
Total U	1	Low Sol	Low Sol	Low Sol

<sup>1</sup>The interstitial liquid composition is based on grab-samples taken in the saltwell. The dissolution brine compositions are based on runs of the ESP code using the Tank 241-S-109 Best Basis Inventory (BBI, 2001) as input

Early dissolution: 1 part water has been added to 4 parts waste

Middle: 1 part water has been added to 1.6 parts waste

Late: 1 part water has been added to 1 part waste

Low Sol: Low solubility in water

In Interstitial Liquid: As modeled in ESP, not present in dissolution brine because 100% is in the interstitial liquid

TIC: total inorganic carbon

TOC: total organic carbon

**Table 6-6. Key Radionuclide Contaminants in Interstitial Liquid and Dissolution Brine Fractions of Tank 241-S-109 Retrieval Stream**

Contaminant	In Interstitial Liquid Normalized to 5 M Na <sup>1</sup> ( $\mu\text{Ci/ml}$ )	In dissolution brine at 5 M Na ( $\mu\text{Ci/ml}$ )		
		During Early Dissolution	During Middle Dissolution	During Late Dissolution
TRU (total)	$7.6 \times 10^{-4}$	Low Sol	Low Sol	Low Sol
Cesium-137	$1.6 \times 10^2$	In Interstitial Liquid	In Interstitial Liquid	In Interstitial Liquid
Strontium-90	$1.4 \times 10^{-1}$	Low Sol	Low Sol	Low Sol
Technetium-99	$1.6 \times 10^{-1}$	In Interstitial Liquid	In Interstitial Liquid	In Interstitial Liquid
Cobalt-60	$2.0 \times 10^{-3}$	Low Sol	Low Sol	Low Sol
Europium-154	$9.7 \times 10^{-2}$	Low Sol	Low Sol	Low Sol
Iodine-129	$3.1 \times 10^{-4}$	In Interstitial Liquid	In Interstitial Liquid	In Interstitial Liquid

<sup>1</sup>The interstitial liquid composition is based on grab-samples taken in the saltwell. The dissolution brine compositions are based on runs of the ESP code using the Tank 241-S-109 Best Basis Inventory (BBI 2001) as input

Early dissolution: 1 part water has been added to 4 parts waste

Middle: 1 part water has been added to 1.6 parts waste

Late: 1 part water has been added to 1 part waste

Low Sol: Low solubility in water

In Interstitial Liquid: As modeled in ESP, not present in dissolution brine because 100% is in the interstitial liquid

#### 6.2.4 Waste Feed Verification

In the course of the RD&D test project, waste feed batches will be received from the Tank 241-S-109 WRS to the waste receipt tanks. These waste feed batches will be sampled for constituents in the assigned waste codes for SST waste. Sampling will determine if these constituents are detectable in the waste feed and the vitrified treated waste will not be tested for the undetected LDR constituents. Processing will not begin until either the results of material analyses are received and reviewed, or a determination has been made that the existing analyses are valid. If necessary, the test plan for that campaign will include procedures to prevent the mixing of materials not suitable for processing. The analytical methods used for measuring concentrations will follow the analytical methods listed in Table 3.3 of the Waste Treatment Plant Waste Analysis Plan (24590-WTP-RPT-ENV-01-003) and the analytical methods listed in Appendix D from the *Regulatory Data Quality Objectives Optimization Report* for the WTP (24590-WTP-RPT-MGT-04-001). Additional sampling and analyses to support risk and performance assessment activities may be conducted and will be defined in test plans, as applicable. Waste feed verification is part of the testing protocol to verify presence of a bounding waste envelope.

1 The waste material composition as treated in the DBVS will represent the vitrification system  
2 waste stream provided by the WTP during full-scale operation. To ensure that the range of waste  
3 properties used during testing properly bounds the WTP waste properties, simulants will be  
4 added as required.

## 5 **6.2.5 Sampling Methods and Frequency**

6 Sampling during Phase 1 will be performed at the WRS waste staging tank prior to transfer to the  
7 DBVS waste receipt tank. The frequency of analysis of the waste during Phase 2 will be once  
8 per full DBVS waste receipt tank, unless a determination has been made that existing waste  
9 analyses are valid. Samples will be collected and analyzed consistent with the applicable  
10 portions of Section 9.0 in the *Regulatory Data Quality Objectives Optimization Report* (24590-  
11 WTP-RPT-MGT-04-001)(Appendix D), which consists of LDR and underlying hazardous  
12 constituent analytical methods.

13 **6.2.5.1 Treated Waste Sampling and LDR Compliance.** The final vitrified waste will be  
14 sampled to provide data for waste form qualification, risk assessment, performance assessment,  
15 and regulatory compliance. The vitrified waste will be tested for waste constituents on the SST  
16 Part A, which are LDR restricted for disposal in WAC 173-303-140 and 40 CFR 268.40. The  
17 constituents analyzed for are based on documented process knowledge, analysis of the waste  
18 feed, and are reasonably expected to be present in the final waste form. A composited vitrified  
19 waste core sample will be analyzed for the dangerous waste constituents that were detected in the  
20 tank waste feed to determine compliance with LDR requirements. The frequency of sampling  
21 the treated waste will be once per vitrified container of waste for an initial 10-sample set, after  
22 which random sampling will take place, as agreed to in the final test matrix.

23 Table 6-7 lists some of the physical properties that the treated waste will be analyzed for in order  
24 to determine waste form qualifications.

## 25 **6.3 SECONDARY WASTE STREAMS**

26 A variety of secondary wastes will be generated during DBVS operations. This section covers  
27 general requirements for management of expected secondary wastes.

### 28 **6.3.1 Secondary Liquid Waste**

29 Secondary liquid waste streams will be stored at the Test and Demonstration Facility area in  
30 portable tanks, prior to being disposed at the 200 Area ETF. Therefore, waste will be  
31 characterized in accordance with the waste characterization requirements specified in Section 3  
32 of the *Hanford Site Liquid Waste Acceptance Criteria* (HNF-3172). The sampling frequency  
33 will initially be once per tank. The long-term sampling frequency will be determined by the  
34 results of initial testing. The secondary liquid waste will be sampled with an appropriate  
35 sampler.

**Table 6-7. Physical Properties Sampling and Analysis<sup>1</sup>**

Property	Requirement	Citation
Vapor Hydration Test	Glass alteration rate shall be less than 50 grams/(m <sup>2</sup> -day) when measured using at least a seven day vapor hydration test run at 200 °C	ASTM WK84, <i>Test Method for Measuring Waste Glass Durability by Vapor Hydration Test</i> .
Compressive Strength after subjecting the samples to conditions noted:	Mean compressive strength of the waste form shall be at least 3.45E6 Pa and not less than 75% of the initial compressive strength	ASTM C39/C39M-01, <i>Standard Test Methods for Compressive Strength Specimens</i>
	Thermal Degradation - Thirty thermal cycles between a high of 60° C and a low of -40° C	ASTM B553-79, <i>Test Method for Thermal Cycling of Electroplated Plastics</i>
	Biodegradation - No evidence of culture growth when representative samples are tested	ASTM G21-96, <i>Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi</i> , and ASTM G22-76, <i>Standard Practice for Determining Resistance of Plastics to Bacteria</i>
Compression Testing	Each fully loaded package shall be able to withstand a compression load of 50,000 kg with the seal remaining intact	Integrated Disposal Facility Waste Acceptance Criteria

<sup>1</sup> Not all tests will be performed on all treated waste. Results from simulant tests may be used where applicable.

### 6.3.2 Secondary Solid Waste

A wide variety of solid and semisolid wastes will be generated during DBVS operation. Waste streams include, but are not limited to, waste material residues in receipt and holding tanks, collected air pollution control equipment dusts/sludges, discarded protective equipment, and discarded samples taken during testing. These materials will be properly designated and packaged per HNF-EP-0063 and managed at the appropriate TSD unit in accordance with the unit's waste acceptance criteria.

Solid waste streams that are designated as dangerous or mixed waste will be transferred to a Hanford Site TSD unit in accordance with the current *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063) and the waste acceptance criteria of the receiving TSD unit. The waste will meet the acceptance criteria as outlined in HNF-EP-0063 as well as the receiving TSD unit acceptance criteria. Process knowledge will be used to better identify the final disposal method.

## 6.4 OFFGAS TREATMENT SYSTEM

The main offgas treatment system exhaust will be monitored continuously for radionuclides contributing greater than 0.1 mrem/year using a record sample collection system. The offgas treatment system will also be continuously monitored for criteria pollutants (i.e., particulate matter, CO, NO<sub>x</sub>, SO<sub>x</sub>).

## **6.5 QUALITY ASSURANCE AND QUALITY CONTROL**

### **6.5.1 General**

This Quality Assurance (QA) and Quality Control (QC) section is prepared to support sampling and analysis to be implemented for DBVS operations. It will be used to support verification and characterization of the waste feed, treated waste form and the characterization of secondary waste streams.

**6.5.1.1** The QA/QC program ensures that an activity or project meets a required quality standard. QA is associated with recordkeeping, tracking, audits and assessments, and involves determining the desired level of quality and setting limits in advance. The analytical methods and associated QA/QC for the constituents of concern and for supplemental analytes identified in 24590-WTP-RPT-MGT-04-001, *Regulatory Data Quality Objectives Optimization Report*, will be imposed on waste feed samples. The laboratory(s) selected to do the analyses will have QA plans approved by Ecology prior to waste sample receipt and performing the selected analytical methods.

**6.5.1.2 Chain-of-Custody.** Chain-of-custody forms are used to document the possession of samples from the time they are collected through completion of laboratory analysis. The following information will be recorded for samples of waste, treatment residuals, and secondary wastes:

- The type of waste collected
- Names and signatures of sampling personnel
- Sample number, date and time of collection, and designation (e.g., grab, core)
- Names and signatures of persons involved in transferring and analyzing samples
- If applicable, the shipping number (air bill number) for samples shipped to off-site laboratories
- Analyses to be performed.

### **6.5.2 Trip Blanks and Equipment Blanks**

The trip blank will be a water sample carried during the sample collection activities to ensure that contamination is not occurring during the different steps of sample collection and transportation to the laboratory. The equipment blank is a sample of analyte-free water used to rinse the sampling equipment. It is used to document the adequate decontamination of sampling equipment. Decontamination will be performed if disposable sampling equipment cannot be used. Analysis for the trip blank and equipment blank will be the same analytical tests performed for the specified procedures.

### **6.5.3 Duplicate Samples**

The duplicate sample is a second aliquot of the collected sample and is used to determine method precision. The relative percent difference of the two samples is calculated by first obtaining the

1 difference of the two samples, dividing the difference by the average of the two samples, and  
2 finally multiplying by 100.

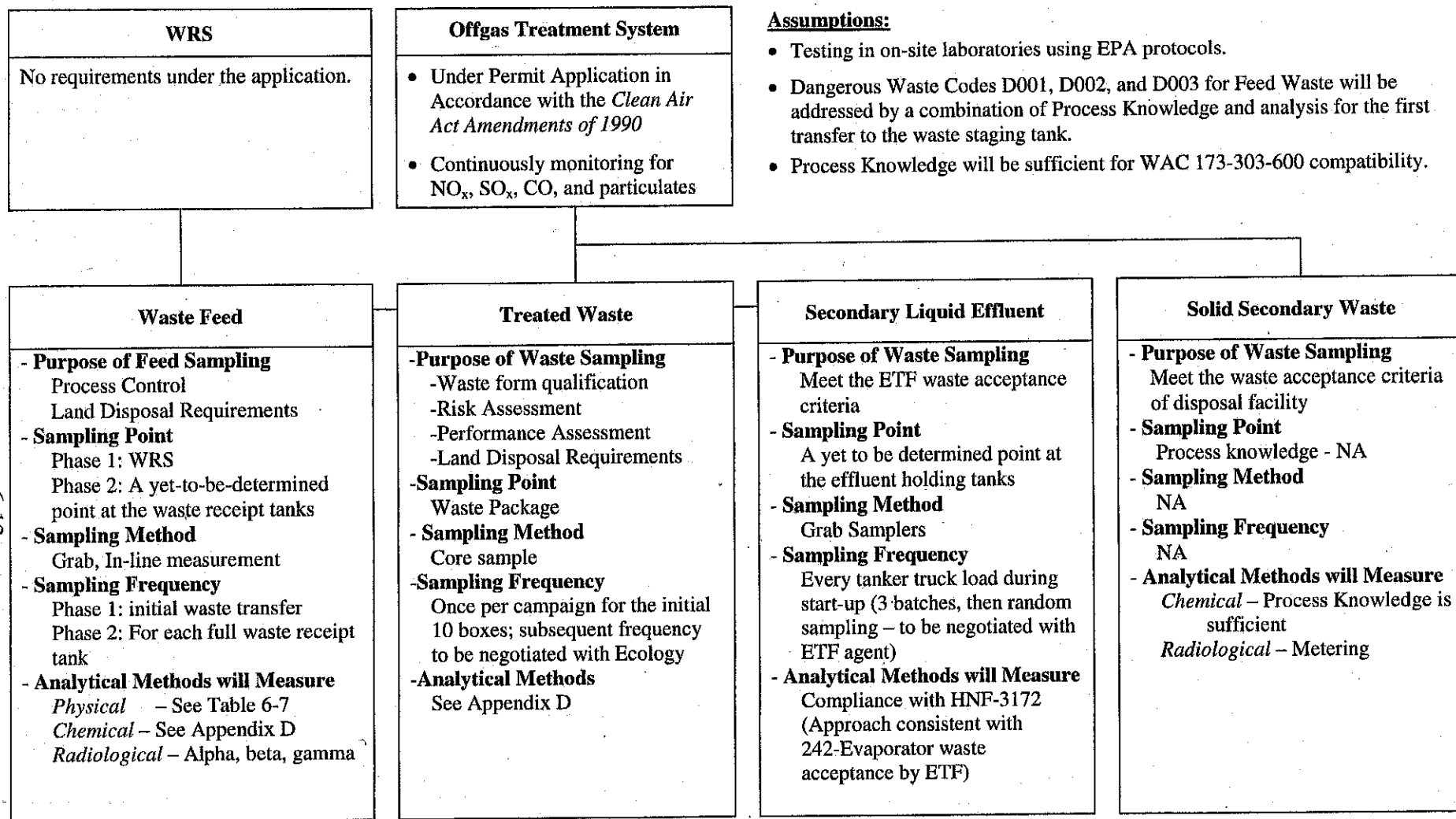
#### 3 **6.5.4 Matrix Spike and Matrix Spike Duplicate Samples**

4 The matrix spike and matrix spike duplicate (MS/MSD) samples are QC samples spiked with  
5 known quantities of analytes. MS/MSD samples ensure that the analysis is testing for the  
6 specific analytes. Precision of a given sample can be calculated by the relative percent  
7 difference between the analytical results for the MS/MSD samples.

8

9

**Figure 6-1. Flow Diagram for DBVS Waste Analysis Plan**



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# **Analytical Methods – Appendix D of the Permit Application**

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**APPENDIX D**  
**ANALYTICAL METHODS**

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24590-WTP-RPT-MGT-04-001, Rev 0  
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## 9.8.3 Analytical Methods

The analytical methods and the target minimum reportable quantity (MRQ) ranges are indicated in Table 9-3 through Table 9-8.

Table 9-3. Methods and Target MRQ Range for Semivolatiles

CAS#	Compound	Analysis	Analytical Method <sup>(a)</sup>	Supernate Target MRQ Range (mg/L)	Sludge Target MRQ Range (mg/kg)
100-00-5	p-Nitrochlorobenzene	SVOA	8270C	0.25-5.00	1.50-5.00
100-25-4	1,4-Dinitrobenzene <sup>(d)</sup>	SVOA	8270C	0.25-25.00	1.50-5.00
106-46-7	1,4-Dichlorobenzene <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	0.50-5.00
108-95-2	Phenol	SVOA	8270C	0.25-20.00	1.50-5.00
110-86-1	Pyridine <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	1.50-5.00
120-82-1	1,2,4-Trichlorobenzene <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	0.50-5.00
120-83-2	2,4-Dichlorophenol <sup>(c), (d)</sup>	SVOA	8270C	---	---
122-39-4	N,N-Diphenylamine	SVOA	8270C	0.25-5.00	1.50-5.00
126-73-8	Tributyl phosphate	SVOA	8270C	0.25-5.00	1.50-5.00
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	SVOA	8270C	0.25-15.00	1.50-5.00
50-32-8	Benzo(a)pyrene	SVOA	8270C	0.25-5.00 <sup>(e)</sup>	1.50-5.00 <sup>(e)</sup>
53-70-3	Dibenz[a,h]anthracene	SVOA	8270C	0.25-5.00 <sup>(e)</sup>	1.50-5.00 <sup>(e)</sup>
541-73-1	1,3-Dichlorobenzene <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	0.50-5.00
59-50-7	4-Chloro-3-methylphenol <sup>(c), (d)</sup>	SVOA	8270C	---	---
627-13-4	Nitric acid, propyl ester <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	2.00-5.00
62-75-9	N-Nitroso-N,N-dimethylamine <sup>(d)</sup>	SVOA	8270C	0.25-6.00	1.50-5.00
67-72-1	Hexachloroethane <sup>(b), (c), (d)</sup>	SVOA/VOA	8270C & 8260B	---	---
82-68-8	Pentachloronitrobenzene (PCNB)	SVOA	8270C	0.25-5.00	1.50-5.00
87-68-3	Hexachlorobutadiene <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	0.50-5.00
87-86-5	Pentachlorophenol <sup>(d)</sup>	SVOA	8270C	0.25-35.00	1.50-5.00
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	SVOA	8270C	0.25-6.00	1.50-5.00
92-52-4	1,1'-Biphenyl	SVOA	8270C	0.25-5.00	1.50-5.00
95-50-1	1,2-Dichlorobenzene <sup>(b)</sup>	SVOA/VOA	8270C or 8260B	0.25-1.00	0.50-5.00
98-86-2	Acetophenone	SVOA	8270C	0.25-5.00	1.50-5.00
98-95-3	Nitrobenzene	SVOA	8270C	0.25-5.00	1.50-5.00

<sup>(a)</sup> Prep methods include SW-846 Methods 3520C and 3510C for the supernate and Methods 3540C and 3550B for the sludge. The Performance Based Measurement System should be applied as appropriate for these methods, adjusting for minor modifications required to safely handle high-level waste samples.

<sup>(b)</sup> These analytes can be determined using either the semivolatile or the volatile method. Hexachloroethane is usually included for analysis with both the semivolatile and volatile method.

<sup>(c)</sup> Hexachloroethane, 2,4-dichlorophenol, 4-chloro-3-methylphenol are not RDQO analytes, however, they are included in the list since they are currently COCs. (—) There has been no method demonstration work performed on these analytes.

<sup>(d)</sup> These analytes were identified in Table 9-2. They will be required during the analysis of regulatory compliance samples.

<sup>(e)</sup> For all analytes, EQLs ≤ target MRQ provided, except for benzo(a)pyrene and dibenz[a,h]anthracene where MDLs ≤ target MRQs.

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Table 9-4. Methods and Target MRQ Range for Volatiles

CAS#	Compound	Analysis	Analytical Method <sup>(a)</sup>	Supernatant Target MRQ Range (mg/L)	Sludge Target MRQ Range (mg/kg)
100-41-4	Ethyl benzene	VOA	8260B	0.10-1.00	0.25-1.00
100-42-5	Styrene	VOA	8260B	0.10-1.00	0.25-1.00
10061-01-5	cis-1,3-Dichloropropene	VOA	8260B	0.10-1.00	0.25-1.00
10061-02-6	trans-1,3-Dichloropropene	VOA	8260B	0.10-1.00	0.25-1.00
106-35-4	3-Heptanone	VOA	8260B	0.10-1.00	0.25-8.50
106-42-3	p-Xylene & m-Xylene	VOA	8260B	0.10-1.00	0.25-1.00
106-93-4	Ethylene dibromide <sup>(d)</sup>	VOA	8260B	0.10-1.00	0.25-1.00
106-97-8	Butane	VOA	8260B	0.10-1.00	0.25-1.00
106-99-0	1,3-Butadiene	VOA	8260B	0.10-1.00	0.25-1.00
107-02-8	Acrolein	VOA	8260B	0.10-1.00	0.25-1.00
107-05-1	3-Chloropropene	VOA	8260B	0.10-1.00	0.25-1.00
107-06-2	1,2-Dichloroethane	VOA	8260B	0.10-1.00	0.25-1.00
107-12-0	Propionitrile	VOA	8260B	0.10-1.00	0.25-2.00
107-13-1	Acrylonitrile	VOA	8260B	0.10-2.00	0.25-1.00
107-87-9	2-Pentanone	VOA	8260B	0.10-5.00	0.25-1.00
108-10-1	4-Methyl-2-pentanone	VOA	8260B	0.10-1.00	0.25-1.00
108-38-3	m-Xylene (see 106-42-3)	VOA	8260B	0.10-1.00	0.25-1.00
108-87-2	Methylcyclohexane	VOA	8260B	0.10-1.00	0.25-1.00
108-88-3	Toluene	VOA	8260B	0.10-1.00	0.25-1.00
108-90-7	Chlorobenzene	VOA	8260B	0.10-1.00	0.25-1.00
108-94-1	Cyclohexanone	VOA	8260B	0.10-1.00	0.25-1.00
109-66-0	n-Pentane	VOA	8260B	0.10-1.00	0.25-1.00
109-99-9	Tetrahydrofuran	VOA	8260B	0.10-1.00	0.25-1.00
110-12-3	5-Methyl-2-hexanone	VOA	8260B	0.10-1.00	0.25-1.00
110-43-0	2-Heptanone	VOA	8260B	0.10-1.00	0.25-1.00
110-54-3	n-Hexane	VOA	8260B	0.10-1.00	0.25-1.00
110-82-7	Cyclohexane	VOA	8260B	0.10-1.00	0.25-1.00
110-83-8	Cyclohexane	VOA	8260B	0.10-1.00	0.25-1.00
111-65-9	n-Octane	VOA	8260B	0.10-1.00	0.25-1.00
111-84-2	n-Nonane	VOA	8260B	0.10-1.00	0.25-1.00
123-19-3	4-Heptanone	VOA	8260B	0.10-1.00	0.25-1.00
123-38-6	n-Propionaldehyde	VOA	8260B	0.10-1.00	0.25-8.50
123-86-4	Acetic acid n-butyl ester	VOA	8260B	0.10-1.00	0.25-1.00
123-91-1	1,4-Dioxane	VOA	8260B	0.10-1.00	0.25-5.00
126-98-7	2-Methyl-2-propenenitrile	VOA	8260B	0.10-1.00	0.25-1.00
127-18-4	1,1,2,2-Tetrachloroethene	VOA	8260B	0.10-1.00	0.25-1.00
141-78-6	Acetic acid ethyl ester	VOA	8260B	0.10-1.00	0.25-1.00
142-82-5	n-Heptane	VOA	8260B	0.10-1.00	0.25-2.00
287-92-3	Cyclopentane	VOA	8260B	0.10-1.00	0.25-1.00
4170-30-3	2-Butenaldehyde (2-Butenal)	VOA	8260B	0.10-1.00	0.25-1.00
56-23-5	Carbon tetrachloride	VOA	8260B	0.10-1.00	0.25-1.00
563-80-4	3-Methyl-2-butanone	VOA	8260B	0.10-1.00	0.25-1.00

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Table 9-4. Methods and Target MRQ Range for Volatiles

CAS#	Compound	Analysis	Analytical Method <sup>(a)</sup>	Supernate Target MRQ Range (mg/L)	Sludge Target MRQ Range (mg/kg)
591-78-6	2-Hexanone	VOA	8260B	0.10-1.00	0.25-1.00
64-17-5	Ethyl alcohol	VOA	8260B	0.10-1.00	0.50-5.00
67-56-1	Methyl alcohol	VOA	8260B	0.10-1.00	0.50-5.00
67-63-0	2-Propyl alcohol (Isopropanol)	VOA	8260B	0.10-1.00	0.25-5.00
67-64-1	2-Propanone (Acetone)	VOA	8260B	0.10-2.00	0.25-5.00
67-66-3	Chloroform <sup>(d)</sup>	VOA	8260B	0.10-1.00	0.25-1.00
67-72-1	Hexachloroethane <sup>(b), (c), (d)</sup>	VOA/SVOA	8260B & 8270C	---	---
71-23-8	n-Propyl alcohol (1-propanol)	VOA	8260B	0.10-1.00	0.50-5.00
71-36-3	n-Butyl alcohol	VOA	8260B	0.25-1.00	0.50-5.00
71-43-2	Benzene	VOA	8260B	0.10-1.00	0.25-1.00
71-55-6	1,1,1-Trichloroethane	VOA	8260B	0.10-1.00	0.25-1.00
74-83-9	Bromomethane	VOA	8260B	0.10-1.00	0.25-1.00
74-87-3	Chloromethane	VOA	8260B	0.10-1.00	0.25-1.00
75-00-3	Chloroethane	VOA	8260B	0.10-1.00	0.25-1.00
75-01-4	1-Chloroethene	VOA	8260B	0.10-1.00	0.25-1.00
75-05-8	Acetonitrile	VOA	8260B	0.10-1.00	0.25-8.50
75-09-2	Dichloromethane (methylene chloride)	VOA	8260B	0.10-1.00	0.25-1.00
75-15-0	Carbon disulfide	VOA	8260B	0.10-1.00	0.25-1.00
75-21-8	Oxirane	VOA	8260B	0.10-1.00	0.25-5.00
75-34-3	1,1-Dichloroethane	VOA	8260B	0.10-1.00	0.25-1.00
75-35-4	1,1-Dichloroethene	VOA	8260B	0.10-1.00	0.25-1.00
75-43-4	Dichlorodifluoromethane	VOA	8260B	0.10-1.00	0.25-1.00
75-45-6	Chlorodifluoromethane	VOA	8260B	0.10-1.00	0.25-1.00
75-65-0	2-Methyl-2-propanol	VOA	8260B	0.10-1.00	0.25-5.00
75-69-4	Trichlorofluoromethane	VOA	8260B	0.10-1.00	0.25-1.00
75-71-8	Dichlorodifluoromethane	VOA	8260B	0.10-1.00	0.25-1.00
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane	VOA	8260B	0.10-1.00	0.25-1.00
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	VOA	8260B	0.10-1.00	0.25-1.00
78-87-5	1,2-Dichloropropane	VOA	8260B	0.10-1.00	0.25-1.00
78-92-2	1-Methylpropyl alcohol (2-butanol)	VOA	8260B	0.25-1.00	0.50-5.00
78-93-3	2-Butanone	VOA	8260B	0.10-1.00	0.25-5.00
79-00-5	1,1,2-Trichloroethane	VOA	8260B	0.10-1.00	0.25-1.00
79-01-6	1,1,2-Trichloroethylene	VOA	8260B	0.10-1.00	0.25-1.00
79-34-5	1,1,2,2-Tetrachloroethane	VOA	8260B	0.10-1.00	0.25-1.00
95-47-6	o-Xylene	VOA	8260B	0.10-1.00	0.25-1.00
96-22-0	3-Pentanone	VOA	8260B	0.10-1.00	0.25-1.00

<sup>(a)</sup> Prep methods include SW-846 Methods 5021 and 5030B for the supernate and Methods 5021, 5035, and 5030B for the sludge. The Performance Based Measurement System should be applied as appropriate to these methods, adjusting for minor modifications required to safely handle high-level waste samples.

<sup>(b)</sup> Hexachloroethane is not a RDQO analyte, however, it is included in the list since it is currently a constituent of concern. (---) There has been no method demonstration work performed on this analyte.

<sup>(c)</sup> Hexachloroethane is usually included for analysis with both the semivolatile and volatile method.

<sup>(d)</sup> These analytes were identified in Table 9-2. They will be required during the analysis of regulatory compliance samples.

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**Table 9-5. Methods and Target MRQ Range for PCBs**

CAS#	Compound <sup>(b)</sup>	Analysis	Analytical Method <sup>(a)</sup>	Supernate Target MRQ Range (mg/L)	Sludge Target MRQ Range (mg/kg)
11096-82-5	Aroclor-1260	PCB	8082	0.025-0.05	0.10-0.25
11097-69-5	Aroclor-1254	PCB	8082	0.025-0.05	0.10-0.25
11104-28-2	Aroclor-1221	PCB	8082	0.025-0.05	0.10-0.25
11141-16-5	Aroclor-1232	PCB	8082	0.025-0.05	0.10-0.25
12672-29-6	Aroclor-1248	PCB	8082	0.025-0.05	0.10-0.25
12674-11-2	Aroclor-1016	PCB	8082	0.025-0.05	0.10-0.25
53469-21-9	Aroclor-1242	PCB	8082	0.025-0.05	0.10-0.25

<sup>(a)</sup> Prep methods include SW-846 Methods 3540C and 3510C for supernate and Methods 3540C and 3550B for sludge. The Performance Based Measurement System should be applied as appropriate to these methods, adjusting for minor modifications required to safely handle high-level waste samples.

<sup>(b)</sup> These analytes were identified in Table 9-2. They will be required during the analysis of regulatory compliance samples.

**Table 9-6. Methods and Target MRQ Range for Pesticides**

CAS#	Compound	Analysis	Analytical Method <sup>(a)</sup>	Supernate Target MRQ Range (mg/L)	Sludge Target MRQ Range (mg/kg)
118-74-1	Hexachlorobenzene <sup>(b)</sup>	Pesticides	8081A	0.05-0.07	0.01-0.07
2234-13-1	Octachloronaphthalene	Pesticides	8081A	0.05-0.07	---
1321-64-8	Pentachloronaphthalene <sup>(c)</sup>	Pesticides	8081A	0.05-2.00	---
1335-87-1	Hexachloronaphthalene <sup>(c)</sup>	Pesticides	8081A	---	---
1335-88-2	Tetrachloronaphthalene <sup>(c)</sup>	Pesticides	8081A	0.05-2.00	0.05-0.07
309-00-2	Aldrin	Pesticides	8081A	0.025-0.05	0.05-0.07
319-84-6	alpha-BHC	Pesticides	8081A	0.025-0.05	0.05-0.07
319-85-7	beta-BHC	Pesticides	8081A	0.025-0.05	0.05-0.07
465-73-6	Isodrin	Pesticides	8081A	0.05-0.5	0.01-0.07
58-89-9	Gamma-BHC (Lindane)	Pesticides	8081A	0.025-0.05	0.05-0.07
60-57-1	Dieldrin	Pesticides	8081A	0.05-0.07	0.01-0.07
72-20-8	Endrin	Pesticides	8081A	0.05-0.07	0.01-0.07
76-44-8	Heptachlor <sup>(b)</sup>	Pesticides	8081A	0.025-0.05	0.05-0.07
8001-35-2	Toxaphene	Pesticides	8081A	0.05-0.07	0.10-0.50

<sup>(a)</sup> Prep methods include SW-846 Methods 3540C and 3510C for supernate and Methods 3540C and 3550B for sludge. The Performance Based Measurement System should be applied as appropriate to these methods, adjusting for minor modifications required to safely handle high-level waste samples.

<sup>(b)</sup> These analytes were identified in Table 9-2. They will be required during the analysis of regulatory compliance samples.

<sup>(c)</sup> Halowax 1014 (CAS#: 12616-36-3) contains the congener mixtures of penta-, hexa-, and tetra-polychlorinated naphthalenes. The analysis of these compounds is dependent on standards availability. The method demonstration was performed on supernate simulant and waste using Halowax 1013 (CAS#: 12616-35-2), which contains the congener mixtures of penta-, tetra-, and tri-polychlorinated naphthalenes. (---) Reporting limits have not been established for this analyte.

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Table 9-7. Methods and Target MRQ Range for Organic Acids

CAS#	Compound	Analysis	Analytical Method <sup>(a)</sup>	Supernatant Target MRQ Range (mg/L) <sup>(a)</sup>	Sludge Target MRQ Range (mg/kg) <sup>(a)</sup>
144-62-7	Oxalic acid	Organic Acid	9056 (IC)	4000-5500	2000-3500
64-18-6	Formic acid	Organic Acid	9056 (IC)	6500-8000	2000-3500
64-19-7	Acetic acid	Organic Acid	9056 (IC)	6500-8000	2000-3500
79-10-7	2-Propenoic acid	Organic Acid	9056 (IC)	6500-8000	5000-6500

<sup>(a)</sup> The preparation for these samples in supernatant is included in SW-846 Method 9056 and for the sludge were included in EPA Method 306.0 and ASTM Method D3987-83. The Performance Based Measurement System should be applied as appropriate to these methods, adjusting for minor modifications required to safely handle high-level waste samples.

<sup>(a)</sup> These reporting limits are greater than 1000, however, they are still within limits that support data needs for these analytes.

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Table 9-8. Methods and Target MRQ Range for Inorganics and Metals

CAS#	Compound	Analytical Method <sup>(a)</sup>	Target MRQ Range (mg/L)	Target MRQ Range (mg/kg)
7440-22-4	Ag <sup>(d)</sup>	6010B or (7761)	2.0-7.5 or (0.8-2.0)	25.0-80.0
7429-90-5	Al	6010B	20.0-45.0	70.0-600
7440-38-2	As <sup>(d)</sup>	6010B or (7060A)	10.0-15.0 or (0.6-2.0)	175-250 or (6.0-10.0)
7440-39-3	Ba <sup>(d)</sup>	6010B	0.55-1.75	6.00-25.0
7440-41-7	Be <sup>(d)</sup>	6010B	0.05-0.25	1.50-5.00
7440-43-9	Cd <sup>(d)</sup>	6010B	1.75-2.50	10.0-25.0
7440-48-4	Co	6010B	2.50-5.00	9.00-35.0
7440-47-3	Cr <sup>(d)</sup>	6010B	0.75-8.50	25.0-110
7440-50-8	Cu <sup>(d)</sup>	6010B	2.00-8.50	40.0-75.0
7439-89-6	Fe	6010B	2.00-20.0	100-200
7439-93-2	Li	6010B	1.50-10.0	35.0-150
7439-95-4	Mg	6010B	9.50-30.0	150-400
7439-96-5	Mn	6010B	0.55-1.75	1.00-15.0
7439-98-7	Mo	6010B	3.00-15.0	40.0-150
7440-23-5	Na	6010B	60.0-250	600-750
7440-02-0	Ni <sup>(d)</sup>	6010B	6.50-15.0	45.0-100
7723-14-0	P	6010B	15.0-80.0	200-250
7439-92-1	Pb <sup>(d)</sup>	6010B	15.0-45.0	100-450
7440-16-6	Rh (ICP-MS) <sup>(b)</sup>	6020	15.0-20.0	0.25-10.00
7704-34-9	S	6010B	50.0-75.0	150-300
7440-36-0	Sb <sup>(d)</sup>	6010B	15.0-20.0	210-250
7782-49-2	Se <sup>(d)</sup>	6010B or (7740)	20.0-30.0 or (2.5-5.0)	175-400 or (26-50)
7440-31-5	Sn	6010B	60.0-100	250-2500 <sup>(c)</sup>
7440-25-7	Ta (ICP-MS) <sup>(b)</sup>	6020	0.25-5.00	8.50-15.0
7440-28-0	Tl <sup>(d)</sup>	6010B	5.50-15.0	175-200
7440-61-1	U	6010B	250-525	1800-3200 <sup>(e)</sup>
7440-62-2	V <sup>(d)</sup>	6010B	2.50-5.00	25.0-50.0
7440-33-70	W	6010B	7.00-125	125-1100 <sup>(c)</sup>
7440-65-5	Y	6010B	1.00-6.00	7.00-100
7440-66-6	Zn <sup>(d)</sup>	6010B	3.50-5.50	15.0-100
7440-67-7	Zr	6010B	2.50-125	15.0-550
7439-97-6	Hg <sup>(d)</sup>	7470A or (7471A)	0.025-1.00	(0.10-3.50)
57-12-5	CN	9010B/9014 or 9012A	2.50-10.00	0.50-3.50

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Table 9-8. Methods and Target MRQ Range for Inorganics and Metals

CAS#	Compound	Analytical Method <sup>(a)</sup>	Target MRQ Range (mg/L)	Target MRQ Range (mg/kg)
7664-41-7	NH <sub>3</sub>	SM-4500-NH <sub>3</sub> -F or EPA Method 350.3	0.08-15.0	0.75-3.50
---	pH <sup>(d)</sup>	Std Method	---	---
16984-48-8	Fluoride	9056 <sup>(e)</sup>	150-500	2.50-25.0
16887-00-6	Chloride	9056 <sup>(e)</sup>	100-500	2.50-25.0
14797-65-0	Nitrite	9056 <sup>(e)</sup>	2600-10000 <sup>(c)</sup>	2.50-50.0
24959-67-9	Bromide	9056 <sup>(e)</sup>	150-500	2.50-25.0
14797-55-8	Nitrate	9056 <sup>(e)</sup>	2600-10000 <sup>(c)</sup>	2.50-50.0
14265-44-2	Phosphate	9056 <sup>(e)</sup>	150-500	2.50-50.0
14808-79-8	Sulfate	9056 <sup>(e)</sup>	150-500	25.0-50.0

<sup>(a)</sup> Prep methods include SW-846 Methods 3010A, 3005A, and 3015 for the supernate and Methods 3050B and 3015 for the sludge. Fusion was also used in the methods demonstration for metals preparation. The Performance Based Measurement System should be applied as appropriate to these methods, adjusting for minor modifications required to safely handle high-level waste samples.

<sup>(b)</sup> Although the ICP-AES methodology (6010B) can be applied to the determination of rhodium and tantalum, the ICP-MS technique (6020) has been demonstrated to achieve reporting limits that better support data needs.

<sup>(c)</sup> These reporting limits are greater than 1000, however, they are still within limits that support data needs for these analytes.

<sup>(d)</sup> These analytes were identified in Table 9-2. They will be required during the analysis of regulatory compliance samples.

<sup>(e)</sup> Prep methods for the inorganic anions were SW-846 Method 9056 for the supernate and EPA Method 300.0 and ASTM Method D3987-85 for the sludge.

( ) - Target MRQ ranges given in parentheses correspond to the methods given in parentheses.

#### 9.8.4 Analytical Method Guidelines

Per the guidelines established using the PBMS and safe handling procedures required to address ALARA concepts, sample sizes may be reduced from those recommended in SW-846. The adjustments to the samples sizes applied to the SW-846 methods and the appropriate scaling of reagents is not considered a modification or a deviation from SW-846. The sample size reduction is typical for the analysis of radioactive samples to ensure safety. The selection of acids, solvents, and surrogates may also be adjusted to address matrix interferences and are within the PBMS guidelines. Minor modifications to SW-846 methods are discussed in Table 9-9 and Table 9-10.

Table 9-9. SW-846 Guidelines and Handling Hanford Tank Waste

SW-846 Methods Guidelines	Procedures for Performing Analysis on Hanford Tank Waste
SW-846 provides recommendations for sample sizes applied to each method.	Sample size reduction, the associated scaling of reagents, and the selection of container sizes applied during sample preparation are not considered deviations from SW-846. This is required to ensure safe handling of the radioactive samples and minimize waste generation.
In some methods, SW-846 describes specific containers or vessels for application of the method and means for transferring materials (for example, pouring).	In cases where the container type may impact ability to safely handle a radioactive sample or where the sample matrix may be affected by the container material, a different container type may be specified for safe handling in laboratory procedures. Procedures may require minor adjustments for safety (for example, using a syringe to transfer the sample rather than pouring the sample). These are considered minor modifications.
SW-846 provides recommended wavelengths for ICP-AES and alternate isotopes for ICP-MS	Adjustments to wavelengths for ICP-AES and selection of alternate isotopes for ICP-MS are not considered deviations from SW-846. This is required to address complex matrix interferences and improve analytical accuracy.

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Table 9-10. Summary of Method Modifications

Analytes	Determinative	Preparation	Modifications <sup>(a)</sup>
SVOA	8270C	3520C, 3510C, 3540C, 3550B	If matrix interferences affect the recoveries of the SW-846 recommended surrogates, additional surrogates may be added to the method surrogate list for the 8270C analysis. If necessary, this should be included in the TSAPs.
VOA	8260B	5021, 5030B, 5021, 5035, 5030B	Minor <sup>(a)</sup>
PCB	8082	3540C, 3510C, 3550B	Minor <sup>(a)</sup>
Pesticides	8081A	3540C, 3510C, 3550B	Minor <sup>(a)</sup>
Organic Acids and Inorganic Anions	9056 (IC)	9056	Organic acid salts are not included in the SW-846 9056 method; however, the IC technique and column selection can be adjusted to determine these analytes and to reduce interferences from the anions and acid salts present in the tank waste.
		EPA Method 300.0 (EPA, 1989)	EPA Method 300.0 is not an SW-846 method.
		ASTM D3987-85 (1999) Shake extraction of solid waste with water	ASTM D3987-85 is not an SW-846 method. An ultrasonic bath rather than shaker may be applied to the preparation of solids if this facilitates proper extraction.
Metals	6010B (ICP-AES) 6020 (ICP-MS)	3010A, 3005A, 3015, 3050B, 3015 (Note: acid digestion methods generally preferred over fusion)	Heat source alternatives (for example, heating block) and solvent selection may be adjusted based on matrix interferences and safe sample handling practices. See Table 9-9.
Silver Arsenic Selenium	7761 (AA) 7060A (AA) 7740 (AA)	ASTM D4503-86 (1998) Dissolution of solid waste by fusion	Not an SW-846 method. The modified ASTM method uses KOH, which supports a broader analyte list, rather than lithium metaborate. ASTM methods are recognized by EPA as equivalent standards.
Mercury	7470A 7471A	NA	Minor <sup>(a)</sup>
Cyanide -CN	9010B/9014 9012A	NA	Selection of distillation apparatus may be adjusted to safely perform distillation.
Ammonia - NH <sub>3</sub>	SM-4500-NH <sub>3</sub> -F	NA	SM-4500-NH <sub>3</sub> -F (Standard Method, 1992) is not an SW-846 method, but is considered equivalent by EPA.
	EPA Method 350.3	NA	EPA Method 350.3 (EPA, 1989) is not an SW-846 method.
pH	Standard Method	NA	Application of laboratory standard pH measurement techniques are considered equivalent by EPA and can be applied to this determination.

NA - not applicable. The preparation procedure for these analytes is included in the determinative method.

AA- atomic absorption spectrometry

<sup>(a)</sup> - The Performance Based Measurement System should be applied as appropriate to these methods, adjusting for minor modifications required to safely handle high-level waste samples. See also the discussion in Table 9-9.

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### 9.8.5 Analytical Quality Control Parameters

The QC parameters in Table 9-11 have been provided with input from a performance assessment of method evaluation and demonstration activities. These performance criteria apply for the analytes and methods described in Table 9-3 through Table 9-8.

Table 9-11. Quality Control Parameters for SW-846 Methods

Analytes	Method	QC Acceptance Criteria			
		LCS % Recovery	Spike % Recovery	MSD/Dup RPD	Replicate % RSD
Metals	ICP-AES-6010B	80-120 %	75-125 %	≤ 20 %	≤ 20 %
Metals	ICP-MS-6020	80-120 %	75-125 %	≤ 20 %	≤ 20 %
Metals	AA-7060A; AA-7740 or equiv	80-120 %	75-125 %	≤ 20 %	≤ 20 %
Hg	CVAA-7470A; 7471A	80-120 %	75-125 %	≤ 20 %	≤ 20 %
Organic Acids and Anions	IC-9056	80-120 %	75-125 %	≤ 20 %	≤ 20 %
pH	pH (Std Method)	± 0.1 pH units	NA	NA	NA
SVOA	8270C	70-130 %	50-150 % <sup>(a)</sup>	≤ 30 %	≤ 30 %
VOA	8260B	70-130 %	50-150 %	≤ 30 %	≤ 30 %
PCBs	8082	70-130 %	50-150 % <sup>(a)</sup>	≤ 30 %	≤ 30 %
Pesticides	8081A	70-130 %	50-150 % <sup>(a)</sup>	≤ 30 %	≤ 30 %

<sup>(a)</sup> Control chart limits should be identified for these analytes as applied to the recoveries associated with the high-level waste matrices as appropriate. The SW-846 Method 8270C acknowledges poor recoveries of phenols and other semivolatiles and recommends expanding the recovery limits to approximately D-175 % for many of these analytes. (D- applies to any result detected above zero at the instrument).

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## 10 References

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# **PERMIT ATTACHMENT CC**

**Personnel Training – Section 8 of the Permit Application**

**Permit Number: WA 7890008967**

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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## 8.0 PERSONNEL TRAINING

### 8.1 INTRODUCTION

All operations and maintenance personnel assigned to processing systems, support services, and treated waste handling activities under the RD&D project will participate in routine health and safety training programs and will be thoroughly trained for the specific tasks they are assigned to perform.

Personnel will be trained in accordance with WAC 173-303-330 and as required by the *Hanford Emergency Management Plan* (DOE/RL-94-02).

Prior to the initial receipt of dangerous and/or mixed waste in the Test and Demonstration Facility, the Permittees shall update and resubmit a final Training Program description to Ecology for review and approval. The final Training Program description shall include but not be limited to:

- Detailed unit specific and general Training Program descriptions consistent with WAC 173-303-806(4)(a)(xii).
- Sufficient detail to document that the training and qualification program for all categories of personnel whose activities may reasonably be expected to directly affect emissions from the Test and Demonstration Facility.

### 8.2 OUTLINE OF TRAINING PROGRAMS

The introductory and continuing training programs are designed to prepare personnel to manage and conduct RD&D activities in a safe, effective, and environmentally sound manner. Training programs ensure that personnel are prepared to respond in a prompt and effective manner should abnormal or emergency conditions occur. Emergency response training will be consistent with the description of actions contained in the Contingency Plan (Section 10.0 and Appendix C). The introductory and continuing training programs will include:

- Training treatment system supplier and subcontractor personnel to perform their duties in a way that ensures compliance with WAC 173-303.
- Training treatment system supplier and subcontractor personnel on dangerous waste management procedures (including implementation of the contingency plan) relevant to the job titles and positions in which they are employed.
- Ensuring that treatment system supplier and subcontract personnel can respond effectively to emergencies.

#### 8.2.1 Introductory Training

Introductory training includes general Hanford Facility training on Material Safety Data Sheets for hazardous material and technology-specific training related to the Test and Demonstration Facility.

All personnel will have successfully completed introductory training before operation of the Test and Demonstration Facility. All new operating personnel will be required to successfully complete the training program upon assignment to the project. Employees will not work in unsupervised positions until they have completed the training required for the position.

### 8.2.2 Continuing Training

Continuing training to meet the requirements of WAC 173-303-330(1)(b) includes general Hanford Facility training and Test and Demonstration Facility-specific training.

A training program will be conducted prior to the start of each test campaign and during the campaign, as required.

## 8.3 DESCRIPTION OF TRAINING DESIGN

Proper design of a training program ensures personnel performing duties related to WAC 173-303-330(1)(d) are trained to perform their duties in compliance with WAC 173-303. Actual job tasks, referred to as duties, are used to determine training requirements as follows:

- The *first step* in ensuring that personnel have received the proper training is to determine and document specific WRS and DBVS system operation and maintenance and waste management duties by job title and/or position.
- The *second step* is to compare specific duties to the unit-training curriculum. If the general unit-training curriculum does not address the duties, then the training curriculum is supplemented and/or the necessary on-the-job training is provided.
- The *third step* is to summarize the training course content necessary to ensure that the training provided for each job title and position addresses duties associated with that position.
- The *final step* is to assign job-specific training curricula to facility and treatment system supplier and subcontractor personnel, based on their most recent position evaluations.

The training plan will be developed when the WRS and DBVS reaches final design and will include all applicable requirements specified in WAC 173-303-330(1)(d). The plan will include a chart indicating project personnel positions, their project functions, and the training required for those positions, including on-the-job training.

Training elements of WAC 173-303-330(1)(d) applicable to the WRS and DBVS operations include the following:

- Procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment
- Key parameters for automatic waste feed cut-off systems
- Communications or alarm systems
- Response to fires or explosions
- Shutdown of operations.

#### 8.4 TRAINING PROGRAM UPDATES

The training program is tiered to provide training updates to personnel at levels that are relevant to their positions within the system operation. Updates will include:

- The status of treatment operating conditions and procedures, noting areas where there are problems or the potential for problems. Employees will be encouraged to participate in developing effective solutions.
- The requirements contained in the RD&D permit and other applicable permits, noting any changes that have occurred since the last update or upon extension of the RD&D permit. Areas of actual or potential compliance problems will be identified and discussed and effective solutions will be sought.
- Incidents that have occurred since the last update that warranted use of safety plans and/or emergency action. This review focuses on the cause of the incident and identification of steps to be taken to prevent or to ensure better handling of such events in the future.

#### 8.5 TRAINING PLAN DOCUMENTATION AND RECORDKEEPING

The training plan documentation consists of one or more documents and/or a training database with all the components identified in the core document WAC 173-303-330(2)(c): "Records documenting that personnel have received and completed the training required by this section. The Department may require, on a case-by-case basis, that training records include employee initials or signature to verify that training was received."

Records of training content, attendance, and certifications will be maintained at the facility. These records will be made available for review by applicable regulatory agencies. All records will be maintained in compliance with applicable OSHA, Ecology, or Washington Department of Health regulations.

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# **PERMIT ATTACHMENT DD**

**Contingency Plan – Section 10 of the Permit Application;  
and  
Hanford Test and Demonstration Facility Contingency  
Plan – Appendix C of the Permit Application**

**Permit Number: WA 7890008967**

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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# **Contingency Plan – Section 10 of the Permit Application**

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10.0 CONTINGENCY PLAN ..... 1

**TABLES**

Table 10-1. Hanford Facility Documents Containing Contingency Plan Requirements of  
WAC 173-303-350(3) ..... 1

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## 10.0 CONTINGENCY PLAN

The WAC 173-303-305 requirements for a contingency plan are satisfied in portions of the *Hanford Emergency Management Plan* (DOE/RL 94-02). The Test and Demonstration Facility Contingency Plan is provided in Appendix C. The Contingency Plan also serves to satisfy a broad range of other requirements (e.g., OSHA standards [29 CFR 1910] and DOE Orders). Table 10-1 identifies how DOE/RL 94-02 and the Contingency Plan satisfy WAC 173-303-305.

**Table C-1. Hanford Facility Documents Containing Contingency Plan Requirements of WAC 173-303-350(3)**

Requirement	<i>Hanford Emergency Management Plan</i> DOE/RL-94-02, Rev. 2	Appendix C Contingency Plan
-350(3)(a) – a description of the actions which facility personnel must take to comply with this section and WAC 173-303-360.	Sections 1.3.2 and 1.3.4 Note <sup>1</sup>	C6.0
-350(3)(c) – A description of the arrangements agreed to by local police departments, fire departments, hospitals, contractors, and state and local emergency response teams to coordinate emergency services as required in WAC 173-303.	Section 3.0 and Table 3.1	NA
-350(3)(d) – A current list of names, addresses, and phone numbers (office and home) of all persons qualified to act as the emergency coordinator required under WAC 173-303-360(1). Where more than one person is listed, one must be named as the primary emergency coordinator, and others must be listed in the order in which they will assume responsibility as alternates. For new facilities only, this list may be provided to the department at the time of facility certification (as required by WAC 173-303-810 (14)(a)(i)), rather than as part of the permit application.	Section 2.2	C3.1
-350(3)(e) – A list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems, and decontamination equipment), where this equipment is required. This list must be kept up to date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.	Hanford Fire Department: Appendix C	C7.0
-350(3)(f) – An evacuation plan for facility personnel where there is a possibility that evacuation could be necessary. This plan must describe the signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes.	Table 5-1 Note <sup>2</sup>	C6.1

<sup>1</sup> The *Hanford Emergency Management Plan* (DOE/RL-94-02) contains descriptions of actions relating to the Hanford Site Emergency Preparedness system and supplements the language contained in the Contingency Plan.

<sup>2</sup> An evacuation route for the Test and Demonstration Facility is provided. Evacuation routes for occupied buildings surrounding the Test and Demonstration Facility are provided through information boards posted within the buildings.

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**Hanford Test and Demonstration  
Facility Contingency Plan –  
Appendix C of the Permit  
Application**

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**APPENDIX C**

**BULK VITRIFICATION TEST AND DEMONSTRATION**

**FACILITY CONTINGENCY PLAN**

May 2004

1 This Contingency Plan covers activities of the Bulk Vitrification Test and Demonstration Facility  
2 located west of the 241-S Tank Farm.

3 This Contingency Plan also serves to satisfy a broad range of requirements (e.g., *Washington*  
4 *Administrative Code* 173-303, Occupational Safety and Health Administration standards  
5 [29 CFR 1910], *Toxic Substances Control Act* [40 CFR 761] and U.S. Department of Energy  
6 Orders). Any revisions made to portions of this Contingency Plan document that are not  
7 governed by the requirements of WAC 173-303 will not be considered as a modification subject  
8 to WAC 173-303-830.

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10 Approved:

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Facility Management

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Date

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Environmental Compliance Officer

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Emergency Management

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22 \_\_\_\_\_  
Hanford Fire Department

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Date

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24  
25 This Contingency Plan will be reviewed at least annually and updated if necessary by facility  
26 management. The building emergency director has the authority to carry out the provisions of  
27 the Contingency Plan.

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ALARA	as low as reasonably achievable
BED	building emergency director
CFR	<i>Code of Federal Regulations</i>
DBVS	demonstration bulk vitrification system
DOE	U.S. Department of Energy
DOE-RL	DOE Richland Operations Office
Ecology	Washington State Department of Ecology
EOC	Emergency Operations Center
HAZOP	Hazard and Operability Study
IC	Incident Commander
ICP	Incident Command Post
L	liter
MSDS	material safety data sheet
PHA	preliminary hazards analysis
POC	Patrol Operations Center
TBD	to be determined
WAC	<i>Washington Administrative Code</i>

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## **C.1.0 GENERAL INFORMATION**

This Contingency Plan describes the facility hazards and the basic responses to upset and/or emergency conditions within the Test and Demonstration Facility. Waste treatment activities using the Demonstration Bulk Vitrification System (DBVS) will be conducted under a research, development, and demonstration project. The Test and Demonstration Facility is owned and operated by the U.S. Department of Energy (DOE), Office of River Protection. It is located west of the 241-S Tank Farm in the 200 West Area within the Hanford Site, a 560-square mile (1,450-square kilometer) DOE site in southeastern Washington State.

The Contingency Plan describes responses to events that may include spills or releases as a result of processing, fires and explosions, transportation activities, movement of materials, packaging, storage of hazardous materials, and natural phenomena. When used in conjunction with DOE/RL-94-02, *Hanford Emergency Management Plan*, this Contingency Plan meets the requirements for contingency planning as required by *Washington Administrative Code* (WAC) 173-303.

### **FACILITY NAME**

Bulk Vitrification Test and Demonstration Facility  
U.S. Department of Energy Hanford Site  
River Protection Project, Tank Farms

### **FACILITY LOCATION**

Benton County, Washington; within the 200 Area of the Hanford Site

### **OWNER/OPERATOR**

U.S. Department of Energy  
Office of River Protection  
P.O. Box 450  
Richland, Washington 99352

### **FACILITY MANAGER/CO-OPERATOR**

CH2M HILL Hanford Group, Incorporated  
P.O. Box 1500  
Richland, Washington 99352

## **C.2.0 DESCRIPTION OF THE UNITS AND OPERATIONS**

The location of the planned site for the Test and Demonstration Facility is shown in Figure C-1. The wastes planned for treatment are currently stored in Tank 241-S-109, a 2,839,050-liter (L) (750,000-gal) single-shell tank located in the 200 West Area. Pretreated waste from Tank 241-S-109 will be transferred directly to the planned facility.

1 The DBVS will receive a salt solution at the waste receipt tanks. The salt solution will be mixed  
2 with appropriate glass formers, and excess water will be removed from the mixture by a  
3 mixer/dryer unit. The mixture will be distributed into a prepared waste container, where  
4 electrodes that penetrate the waste mixture will vitrify the waste via resistive heating. The  
5 vitrified mass will be allowed to cool before being moved to a storage area within the Test and  
6 Demonstration Facility for waste product testing.

7

### 1 C.3.0 IMPLEMENTATION OF THE PLAN

#### 2 C.3.1 BUILDING EMERGENCY DIRECTOR

3 Emergency response will be directed by the building emergency director (BED) until the  
4 incident commander arrives. The BED position will be staffed 24 hours a day by the Shift  
5 Manager. The BED will utilize the Incident Command System supplemented by the Test and  
6 Demonstration Facility-specific emergency response procedures described herein. The Incident  
7 Command System and trained staff will be used in conjunction with on-call personnel to fulfill  
8 the responsibilities of the Emergency Coordinator as described in WAC 173-303-360. The BED  
9 becomes a member of the Incident Command Post and functions under the incident commander.  
10 In this role, the BED continues to manage and direct operations at the Test and Demonstration  
11 Facility.

12 A listing of BEDs by title, work location and work telephone number is contained in Table C-1  
13 of this plan. The BED is on the premises or is available through an "on-call" list 24 hours a day.  
14 Names and home telephone numbers of the BEDs are available from the Patrol Operations  
15 Center.

**Table C-1. BED Contact Information**

Name	Title	Site Telephone Number(s)	Home Telephone Number(s)
To be provided prior to start of operation.			

#### 17 C.3.2 DETERMINATION OF EVENT

18 The BED ensures that trained personnel identify the character, source, amount, and areal extent  
19 of the release, fire, or explosion to the extent possible. Identification of waste can be made by  
20 activities that can include, but are not limited to, visual inspection of involved containers,  
21 sampling activities in the field, reference to inventory records, or by consulting with facility  
22 personnel. Samples of materials involved in an emergency might be taken by qualified  
23 personnel and analyzed as appropriate. These activities must be performed with a sense of  
24 immediacy and shall include available information.

25 The BED shall use the following guidelines to determine if an event has met the requirements of  
26 WAC 173-303-360(2)(d):

- 27 1. The event involved an unplanned spill, release, fire, or explosion

28 AND

- 29 2.a The unplanned spill or release involved a dangerous waste, or the material  
30 involved became a dangerous waste as a result of the event (e.g., product that is  
31 not recoverable.)

32 OR

- 2.b The unplanned fire or explosion occurred at the waste processing equipment or storage area or transportation activity subject to RCRA contingency planning requirements

AND

3. Time-urgent response from an emergency services organization was required to mitigate the event, or a threat to human health or the environment exists.

As soon as possible, after stabilizing event conditions, the BED shall determine, in consultation with the tank farm site contractor environmental point-of-contact, if notification to Ecology is needed to meet WAC-173-303-360 (2)(d) reporting requirements. If all of the conditions under 1, 2, and 3 above are met, notifications are to be made to Ecology. Additional information concerning emergency response reporting requirements is found in *Hanford Emergency Management Plan*, Section 4.2 (DOE/RL-94-02). Any release above the "reportable quantity" must also be reported to the National Response Center. If review of all available information does not yield a definitive assessment of the danger posed by the incident, a worst-case condition will be presumed and appropriate protective actions and notifications will be initiated. The BED is responsible for initiating any protective actions based on his or her best judgment of the incident.

The BED will assess each incident to determine the response necessary to protect personnel, the facility, and the environment. If assistance from Hanford Patrol, Hanford Fire Department, or ambulance units is required, the Hanford Emergency Response Number (9-1-1) must be used to contact the Patrol Operations Center and request the desired assistance. To request other resources or assistance from outside the Test and Demonstration Facility, the Patrol Operations Center business number is used (373-3800).

### C.3.3 EMERGENCY RESPONSE INTEGRATION AND COORDINATION

The emergency response approach, procedures, and implementation of the Contingency Plan will typically depend on the assessment provided by onsite, trained personnel. However, it is the Shift Manager (acting as the BED) that will, depending on the extent and nature of the incident, identify the need for additional support services from other onsite operations and/or 200 Area-wide emergency resources. Effective integration and coordination between the operations occurring at the Test and Demonstration Facility and other operations being conducted in the 200-Area will be essential to maximize response speed and efficiency in dealing with possible emergency response incidents. This coordinated response will be in place to respond to emergency incidents directed to:

- Saving human lives
- Preservation of the environment
- Protection of property
- Prevention of operation disruption and incident escalation
- Restoring normal conditions as soon as possible
- Assessing the effectiveness of the response for future incidents.

1 It will be the responsibility of the Shift Manager to develop, at the operational level, the  
2 necessary steps and measures required to assess the emergency incident and determine the  
3 command, control, and coordination requirements with other entities working nearby that can  
4 respond to an incident occurring at the Test and Demonstration Facility. Conversely, a hazard or  
5 incident that could impact the Test and Demonstration Facility operations will require integration  
6 and coordination by other BEDs with the Facility BED.

#### 7 **C.4.0 FACILITY HAZARD IDENTIFICATION**

8 The operational strategy for the Test and Demonstration Facility activities consists of a design  
9 concept and operational approach that has as the primary goal of safety to the on-site workers  
10 and general public. The design and operations approach will be developed in accordance with  
11 Hanford Site practices to ease transition from design and system testing to operations. Chemical  
12 and radiological constituent hazards that could occur during Test and Demonstration Facility  
13 project activities will be identified in a preliminary hazards analysis (PHA) using information  
14 developed from the Hazard and Operability Study (HAZOP) sessions. The PHA and HAZOP  
15 sessions will be conducted based on DBVS treatment equipment design following guidance  
16 provided in the *Implementation Guide for Use in Developing Documented Safety Analysis to*  
17 *Meet Subpart B of 10 CFR 830* (DOE G 421.1-2). In addition, a hazards assessment evaluation  
18 is also required by Section 1.3.3.2 of DOE-RL-94-02. The PHA and hazards assessment analysis  
19 will be conducted to:

- 20 • Identify the key configuration and operating assumptions needed to evaluate  
21 radiological, toxicological, and other impacts to the public and workers relative to  
22 activities associated with Test and Demonstration Facility activities.
- 23 • Determine facility hazard classification as defined in DOE-STD-1027-92.
- 24 • Verify that the design identifies and addresses fundamental hazards of the process.
- 25 • Evaluate hazards and identify available controls and control strategies for safe  
26 handling of the mixed waste materials and equipment to be used.
- 27 • Identify accident scenarios including typical and representative scenarios for this type  
28 of waste treatment and storage use as well as scenarios specifically related to Test and  
29 Demonstration Facility activities.
- 30 • Identify all safety structures, systems, and components.

31 The objective of this section is to describe, in general terms, the hazards that pose significant risk  
32 to human health and the environment. Prior to the introduction of mixed waste to the Test and  
33 Demonstration Facility, this Plan will be reviewed and updated based on findings from the  
34 hazards analysis and review of the 100% completed design package.

#### 35 **C.4.1 MIXED WASTE HANDLING**

36 The basis for safe handling of mixed tank waste being treated, stored, and tested in the Test and  
37 Demonstration Facility will be the design, PHA findings, requirements of 29 *Code of Federal*  
38 *Regulations* (CFR) 1910 related to construction and occupational safety and health, and the  
39 environmental safety and regulatory requirements in accordance with WAC 173-303. As low as

1 reasonably achievable (ALARA) concepts for radiation exposure control will be used for design  
2 in accordance with 10 CFR 835 and will be consistent with practices called out in DOE-STD-  
3 1128-98 for radiological protection. In conjunction with the requirements stated in WAC 173-  
4 303, ALARA principles will be used as a guide for the procedures that address the management  
5 of mixed waste and will be fully developed prior to the commencement of operations. The Test  
6 and Demonstration Facility will be designed as a contact handled facility in accordance with  
7 expected dose rates.

#### 8 **C.4.2 INDUSTRIAL HAZARDS**

9 The basis for safe use of the systems, components, and equipment for the treatment and storage  
10 of mixed waste will be the design package, PHA findings, occupational safety and health  
11 requirements stated in 29 CFR 1910, provisions of WAC 173-303, and material safety data  
12 sheets (MSDSs). The procedures that address these hazards will be in place prior to  
13 implementation of this Plan. Site operators and workers will be trained in the safe use and  
14 handling of equipment and systems provided.

#### 15 **C.4.3 PERSONNEL EXPOSURE**

16 As applicable, radiation shielding will be incorporated into the design where a large mass of  
17 waste creates a potential hazard to personnel.

#### 18 **C.4.4 HAZARDOUS MATERIALS**

19 Potentially hazardous materials will be used during normal operations, maintenance, and support  
20 of Test and Demonstration Facility activities. These materials include diesel fuels, oils, solvents,  
21 acids, caustics, and sorbents. MSDSs will be available on-site for review and use by the  
22 operators and workers.

23 In conjunction with the MSDSs, safe design of the plant, PHA findings using the HAZOP  
24 sessions, 29 CFR 1910, and WAC 173-303 provisions will be the basis for safe use of the  
25 materials on-site. Procedures will be in place and applicable training conducted to address the  
26 handling and use of hazardous materials before the introduction of these materials.

#### 27 **C.5.0 NATURAL PHENOMENA**

28 The following information presents a very basic standard approach to the potential hazards of  
29 natural phenomena type events.

#### 30 **C.5.1 SEISMIC EVENT**

31 Depending on the magnitude of the event, severe structural damage can occur resulting in serious  
32 injuries or fatalities and the release of dangerous and/or radioactive materials to the environment.  
33 Individuals should remain calm and stay away from windows, steam lines, and hazardous  
34 material storage locations and onsite container storage areas. Once the ground acceleration has  
35 subsided, individuals should evacuate carefully and assist personnel needing help. The location  
36 of any trapped individuals should be reported to the BED or to 9-1-1 (or 509-373-3800 if using a

cell phone). The BED will take whatever actions are necessary to minimize damage and personnel injuries. Responsibilities include:

- Coordinating searches for personnel and potential hazard conditions (e.g., fires, spills)
- Conducting accountability of personnel
- Securing utility and facility operations
- Arranging rescue efforts and notifying 9-1-1 for assistance
- Determining if hazardous materials were released
- Warning other facilities and implementing protective actions if release of hazardous materials pose an immediate danger
- Providing personnel and resource assistance to other facilities, if required and possible.

#### **C.5.2 HIGH WINDS/TORNADOES**

High winds or tornadoes may cause structural damage to systems containing dangerous waste and/or radioactive materials resulting in a release to the environment. High winds or tornadoes impact personnel as a respiratory hazard; by reducing visibility; by causing doors, gates to open/close unexpectedly; and from flying objects. Upon notification of impending high winds, the BED will take steps necessary to secure all outdoor waste and dangerous material containers and storage locations. Ventilation, utilities, and operations will be shut down as appropriate to lessen the severity of impact.

#### **C.5.3 FLOOD**

The 200 West Area is well above the projected flood elevations for the Columbia and Yakima Rivers.

#### **C.5.4 RANGE FIRE**

The hazards associated with a range fire are the same as those associated with a building fire plus potential site restrictions and travel hazards such as poor visibility. Response to range fires is handled by preventive measures (i.e., keeping hazardous materials and waste accumulation areas free of combustible materials such as weeds and brush). If a range fire should come within the vicinity of the Test and Demonstration Facility the response will be as described in Section C.6.4.4.

#### **C.5.5 AIRCRAFT CRASH**

The response to an aircraft crash is the same as for a fire and/or explosion (Section C.6.4.4).

#### **C.6.0 INCIDENT RESPONSE**

The steps identified in the following description of actions do not have to be performed in the sequence presented, because the sequence of actual incident events cannot be anticipated.

## **C.6.1 EVACUATION OF THE TEST AND DEMONSTRATION FACILITY**

If an evacuation is ordered or the evacuation siren sounds at the Test and Demonstration Facility personnel shall proceed to the staging areas as depicted in Figure C-2. The Test and Demonstration Facility may need to be evacuated when conditions warrant (such as fire, explosion, release of mixed waste). Evacuation will be initiated by automatic alarms or directed by the BED. The evacuation alarm is a steady siren signal. The BED will use the Test and Demonstration Facility emergency response procedures, experience, and training to determine when conditions warrant evacuation.

The BED or staging area manager will direct the evacuation; however, to ensure that evacuations will be conducted promptly and safely, all personnel shall be familiar with the correct evacuation procedure. The BED will initiate the evacuation of the Test and Demonstration Facility area with a verbal announcement or by manually initiating an evacuation alarm. As conditions warrant, telephoning the Patrol Operation Center (POC), using either 9-1-1 (preferred) or 509-373-3800 will activate the 200 Area evacuation alarms. The BED will ascertain if an alternate staging area should be used based on the location of the emergency condition, wind direction, and tank farm emergency procedures.

Area evacuations are either rapid or controlled, as detailed in the following steps. Operators and other site workers at the Test and Demonstration Facility will be trained on evacuation routes and procedures. Routes will be clearly marked and maintained clear of all obstructions. The BED will determine the operating configuration of the Test and Demonstration Facility and identify any additional protective actions needed for limiting exposure of personnel to the hazard.

Staging areas will be designated when the site layouts have been finalized. Staging areas will be based on prevailing wind direction, gate locations, and roadways leading to and from the sites. Alternate staging areas will be made available for use if the wind direction or other circumstances dictate.

For any evacuation, accountability will be performed at the staging area using personnel given standing assignments and having training in the Test and Demonstration Facility emergency response procedures. These personnel will report to the BED via radio communication after conducting a head count. When personnel cannot be accounted for, personnel properly trained in emergency response operations will conduct active searches. When possible, the following steps must be conducted concurrently.

### **C.6.2 AREA EVACUATION PROCEDURE**

The area evacuation procedure includes the following:

- Halt any operations or work and place the equipment and structures in a safe condition. Use emergency shutdown procedures for rapid evacuation.
- Use whatever means are available (bullhorns, runners, etc.) to pass the evacuation information to personnel.
- Evacuate personnel to the staging area; group personnel as follows: potentially contaminated protective clothing, keys immediately available for vehicles, those needing rides. Assist personnel that are temporary/permanently disabled.
- Conduct personnel accountability. If unable to account for personnel, report personnel accountability results to the Hanford-Emergency Operations Center (Hanford-EOC) (373-1786, 373-3876, 376-8612, 376-4712).
- Inform Incident Commander (IC) of any potentially affected personnel (i.e., injured, contaminated, exposed, etc.) once the IC arrives at the Incident Command Post (ICP).
- Relay pertinent evacuation information (routes, destination, etc.) to drivers.
- Dispatch vehicles as soon as the vehicles are loaded.
- Report status to the Hanford-EOC, request additional transportation if required, and report if any personnel remain who are performing late shutdown duties.

### **C.6.3 TAKE COVER PROCEDURES**

The BED will initiate a local take cover notice for the RD&D project area using the facility communications systems. In the 200 Area, the BED will initiate the take cover alarm by telephoning the POC, using either 9-1-1 (preferred) or 509-373-3800. The take cover alarm is a wavering siren signal. A take cover order will be based on the operating configuration, weather conditions, type and duration of release and other conditions, as applicable to the event and the associated hazard. The intent of the take cover order is to minimize personnel exposure to hazardous materials and move personnel to locations where additional instructions can be provided.

When the take cover alarm is activated, personnel will stop work, place operating equipment in a safe condition, and take cover in the nearest building capable of providing shelter from an airborne hazard. Exterior doors and windows will be closed; and heating, ventilation, and air conditioning systems will be secured.

## **C.6.4 RESPONSE TO TEST AND DEMONSTRATION FACILITY OPERATIONS EMERGENCIES**

Depending on the severity of the event, the BED reviews site-wide and Test and Demonstration Facility emergency response procedure(s), and as required, categorizes and/or classifies the event. If necessary, the BED initiates area protective actions and Hanford Site Emergency Response Organization activation. The steps identified in the following description of actions do not have to be performed in sequence because of the unanticipated sequence of incident events.

### **C.6.4.1 Loss of Utilities**

A case-by-case evaluation is required for each event to determine loss of utility impacts. When a BED determines a loss of utility impact, actions are taken to ensure dangerous and/or mixed waste is being properly managed, to the extent possible, given event circumstances. As necessary, the BED will stop operations and take appropriate actions until the utility is restored.

Should there be a partial or total loss of electrical power to the Test and Demonstration Facility, automatic measures and features as designed will ensure the treatment units and support systems are in a safe operational configuration (defined as a shutdown to minimal operations that will prevent releases and prevent unnecessary damage to the equipment). Upon loss of power, the backup power system will automatically be engaged.

With any loss of the raw water system, operations will be restricted until adequate process water is available.

The BED, in conjunction with the emergency response or incident command personnel, will undertake the following actions in the event of a ventilation system failure:

- Locate the source of the problem and take necessary steps to control the event
- Ensure appropriate areas have been evacuated
- Monitor contamination levels in the plant
- Restore ventilation system.

### **C.6.4.2 Major Process Disruption or Loss of Plant Control**

If there is a major process disruption, the BED will be notified while an attempt is made to return the affected Test and Demonstration Facility activities to service. The BED will compare the situation to criteria provided in the facility categorization/classification procedure to determine whether an operational emergency is occurring. If it is determined that an operational emergency is in progress, the BED will make the appropriate categorization/classification, initiate protective actions, begin the notification process, and request that the emergency response action be activated. The system condition will be addressed, and mitigative/corrective actions will be implemented.

### C.6.4.3 Pressure Release

On discovery of an existing or potential pressure hazard at the Test and Demonstration Facility activities area, ensure the following response:

- Notify personnel to leave the area of the hazard
- Inform the BED
- Evacuate affected areas.

Perform sampling or testing in accordance with recommendations from engineering and industrial safety, and (if indicated) repackage any containers with pressure buildup.

### C.6.4.4 Fire and/or Explosion

In the event of a fire, the discoverer activates a fire alarm (pull box); calls 9-1-1 (373-3800 if using a cellular phone) or verifies that 9-1-1 has been called. Automatic initiation of a fire alarm (through the smoke detectors and sprinkler systems) is also possible.

- Unless otherwise instructed, personnel shall evacuate the area by the nearest safe exit and proceed to the designated staging area for accountability.
- On actuation of the fire alarm, ONLY if time permits and depending on the location and severity of the fire, trained and certified operations personnel may initiate equipment shutdown, secure waste, and lock up classified materials (or hand-carry them out). The alarm automatically signals the Hanford Fire Department.
- The BED proceeds directly to the ICP, obtains all necessary information pertaining to the incident, and sends a representative to meet Hanford Fire Department.
- The BED provides a formal turnover to the IC, when the IC arrives at the ICP.
- The BED informs the Hanford Site Emergency Response Organization as to the extent of the emergency (including estimates of dangerous waste, mixed waste, or radioactive material quantities released to the environment).
- If operations are stopped in response to the fire, the BED ensures that systems are monitored for leaks, pressure buildup, gas generation, and ruptures.

The following is representative of the type of information that the BED may be called on to provide to the incident command structure or other response agencies:

- Location and health of personnel, including missing personnel and possible locations for fire fighters to search for them.
- Location and severity of fire, including character, exact source, and the amount, area, and extent of any released materials.
- Known hazardous conditions (such as radiological, non-radiological, electrical, thermal, flammable materials, pressurized cylinders, toxic gas, pressure systems, batteries, radiation areas).
- Test and Demonstration Facility operating status.

- Utility systems status.
- Layout of the Test and Demonstration Facility.

The BED may be called upon to assist with certain activities, including the following:

- Conduct radiological monitoring, surveys, sampling and decontamination in concert with Test and Demonstration Facility activities radiological control personnel.
- Support firefighter activities as required.
- Notification as required in accordance with plant procedures and DOE/RL-94-02, Section 5.1.1.

Following a fire and/or explosion, WAC 173-303-640(7) will be addressed for the Test and Demonstration Facility tank systems that may have been affected regarding fitness for use.

#### **C.6.4.5 Hazardous Materials, Dangerous and/or Mixed Waste Spill or Release**

Spills can result from many sources including process leaks, tank and/or container spills or leaks, damaged packages or shipments, liquid waste transfer and transportation, or personnel error. Spills or releases of mixed waste are complicated by the need to deal with the extra hazards posed by the presence of radioactive materials.

The discoverer notifies the BED and initiates "SWIMS" response:

- Stops work
- Warns others in the vicinity
- Isolates the area
- Minimizes the spill if possible
- Secures ventilation.
- The BED determines whether emergency conditions exist requiring response from the Hanford Fire Department, based on classification of the spill and injured personnel, and evaluates the need to perform additional protective actions.
- If the Hanford Fire Department resources are not needed, the spill is mitigated with resources identified in Section 8.0 of this Contingency Plan and proper notifications are made.
- If the Hanford Fire Department resources are needed, the BED calls 9-1-1 (373-3800 if using a cellular telephone).
- The BED sends a representative to meet the Hanford Fire Department.
- The BED provides a formal turnover to the IC when the IC arrives at the ICP.
- The BED informs the Hanford Site Emergency Response Organization of the extent of the emergency (including estimates of dangerous waste, mixed waste, or radioactive material quantities released to the environment).

- If operations are stopped in response to the spill, the BED ensures that systems are monitored for leaks, pressure buildup, gas generation, and ruptures.
- The Hanford Fire Department stabilizes the spill.

#### **C.6.4.6 Damaged or Unacceptable Shipments**

Waste materials will not be received at the Test and Demonstration Facility in containerized form, therefore, no damaged or unacceptable shipments will be received.

#### **C.6.4.7 Prevention or Recurrence or Spread of Fires, Explosions or Releases**

The BED will take the steps necessary to ensure that a secondary release, fire, or explosion does not occur. The BED will take measures, where applicable, to stop processes and operations, collect and contain released wastes, and remove or isolate containers. The BED shall also monitor for leaks, pressure buildups, gas generation, or ruptures in valves, pipes or other equipment, whenever this is appropriate.

### **C.7.0 INCIDENT RECOVERY AND RESTART OF OPERATIONS**

A recovery plan is developed when necessary, in accordance with DOE/RL-94-02, Section 9.2. Following an incident at either treatment unit or in the container storage area, a recovery plan is needed where further risk could be introduced to personnel or the environment through recovery action, and/or to maximize the preservation of evidence.

For a recovery plan to be implemented in accordance with this Contingency Plan, Ecology must be notified before operations can resume. The DOE/RL-94-02, Section 5.1, discusses different reports to outside agencies. This notification is in addition to those required reports and must include the following statements:

- There are no incompatibility issues with the waste and released materials from the incident.
- All the equipment has been cleaned, is fit for its intended use, and has been placed back into service.

The notification required by WAC 173-303-360(2)(j) can be made via telephone conference. Additional information that Ecology requests regarding these restart conditions will be included in the required 15-day report identified in Section C.10 of this Contingency Plan.

For emergencies not involving activation of the Hanford-EOC, the BED ensures that conditions are restored to normal before operations are resumed. If the Hanford Site EOC was activated and the emergency phase is complete, a special recovery organization could be appointed at the discretion of the DOE Richland Operations Office (DOE-RL) to restore conditions to normal. This process is detailed in DOE-RL and contractor emergency procedures. The makeup of this organization depends on the extent of the damage and the effects. The onsite recovery organization will be appointed by the appropriate contractor management.

## **C.7.1 INCOMPATIBLE WASTE**

After an event, the BED or the onsite recovery organization ensures that no waste that might be incompatible with the released material is treated, packaged, stored, and/or disposed of until cleanup is completed. Cleanup actions are taken by personnel at the Test and Demonstration Facility or other assigned personnel. DOE/RL-94-02, Section 9.2.3, describes actions to be taken. If incompatibility of waste was a factor in the incident, the BED or the onsite recovery organization ensures that the cause is corrected before operations resume.

## **C.7.2 POST EMERGENCY EQUIPMENT MAINTENANCE AND DECONTAMINATION**

All equipment used during an incident will be decontaminated (if practicable) or disposed of as spill debris. Decontaminated equipment will be checked for proper operation before storage for later use. Consumables and disposable materials will be restocked and discharged fire extinguishers replaced.

The BED ensures that all equipment is cleaned and fit for its intended use before operations resume. Depleted stocks of neutralizing and absorbing materials will be replenished and protective clothing cleaned or disposed of and restocked.

## **C.8.0 EMERGENCY EQUIPMENT**

Hanford Site emergency resources and equipment are described and listed in DOE/RL-94-02, Appendix C. Emergency resources specific to the Test and Demonstration Facility are identified in this section.

### **C.8.1 FIXED EMERGENCY EQUIPMENT**

Type	Location	Capability
TBD	TBD	TBD

### **C.8.2 PORTABLE EMERGENCY EQUIPMENT**

Type	Location	Capability
Fire extinguishers	TBD	Fire control
Dry chemical	TBD	Class A, B, and C fires

### **C.8.3 COMMUNICATION EQUIPMENT/WARNING SYSTEMS**

Type	Location	Capability
Hand-held radios	Portable	Communications

#### C.8.4 PERSONAL PROTECTIVE EQUIPMENT

Type	Location	Capability
Full-face respirator	TBD	Protection from respiratory hazards
PPE clothing	TBD	Protection from specific exposure hazards

#### C.8.5 SPILL CONTROL AND CONTAINMENT SUPPLIES

Type	Location	Capability
Spill control kit	Throughout the facility	Cleanup organic solvents, inorganic solvents, acids, caustics, oxidizers; radiation rope and signs

#### C.9.0 INCIDENT COMMAND POST

The ICP for the Test and Demonstration Facility is in Building (to be determined). Emergency resource materials are stored at each location. The Hanford Fire Department Mobile Command Unit could be activated if necessary.

#### C.10.0 REQUIRED REPORTS

Post-incident written reports are required for certain incidents on the Hanford Site. The reports are described in DOE/RL-94-02, Section 5.1.

Facility management must note in the Test and Demonstration Facility activities operating record, the time, date and details of any incident that requires implementation of the Contingency Plan. Within fifteen days after the incident, a written report must be submitted to Ecology. The report must include the elements specified in WAC 173-303-360(2)(k).

#### C.11.0 CONTINGENCY PLAN LOCATION AND AMENDMENTS

Copies of this Contingency Plan are maintained at the following locations:

- TBD.

This Contingency Plan will be reviewed and immediately amended as necessary, in accordance with DOE/RL-94-02, Section 14.3.1.1.

**C.12.0 REFERENCES**

- 10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.
- 29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.
- 40 CFR 761, "Toxic Substances Control Act," *Code of Federal Regulations*, as amended.
- DOE G 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analysis to Meet Subpart B of 10 CFR 830*, U.S. Department of Energy, Washington, D.C.
- DOE/RL-94-02, *Hanford Emergency Management Plan*, as amended, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE-STD-1027-92, 1992, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, U.S. Department of Energy, Washington, D.C.
- DOE-STD-1128-98, June 1998, *Guide of Good Practices for Occupational Radiological Protection in Plutonium Facilities*, U.S. Department of Energy, Washington, D.C.
- WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Washington State Department of Ecology, Olympia, Washington, as amended.

# **PERMIT ATTACHMENT EE**

**Closure Plan – Section 11 of the Permit Application**

**Permit Number: WA 7890008967**

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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## **11.0 CLOSURE PLAN**

### **11.1 INTRODUCTION**

Closure of RD&D activities differs from closure of a full-scale operating unit at the Hanford Site. All equipment and facilities related to the Test and Demonstration Facility are only temporarily located west of the 241-S Tank Farm; no permanent waste storage or disposal facilities will be constructed at the Test and Demonstration Facility. Therefore, the scope of closure activities is limited to those applicable to decontamination and removal of treatment equipment, decontamination of the site (if applicable), and restoration of the site to its pre-RD&D activity state. The vadose zone under the Test and Demonstration Facility may already be contaminated from previous tank farm activities and is not within the scope of the Test and Demonstration Facility closure plan.

### **11.2 REGULATORY COMPLIANCE**

Closure and partial closure activities will comply with applicable portions of WAC 173-303-610. Some equipment may be removed during the course of the RD&D project and the remainder will be removed at the completion of the project. A one-year extension to the closure period may be requested. Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Facilities*, will be used to guide closure activities.

### **11.3 CLOSURE PERFORMANCE STANDARDS**

Per WAC 173-303-610(2)(a), the Test and Demonstration Facility will be closed in a manner that protects human health and the environment, minimizes the need for further maintenance, and returns the land to the appearance and use of surrounding land areas. Closure will require the removal and disposal of all dangerous waste present, removal of contaminated process equipment and contaminated structural components; and removal of all soil contaminated by RD&D operations in accordance with the HFFACO approach to closure. Any materials, equipment, or structures removed will be designated in accordance with WAC 173-303-070 and disposed. Equipment that does not meet the clean debris rule or cannot be 100% inspected will be managed as mixed waste and disposed appropriately.

### **11.4 CLOSURE ACTIVITIES**

Closure activities will entail decontamination and/or removal and disposal of all equipment. The general order of closure activities has been selected to minimize the potential release of mixed waste constituents by removing the bulk of the mixed waste early in the closure process. Work will be performed in a manner that verifies worker exposure to dangerous and/or mixed waste, radioactivity, hazardous chemicals, or other workplace hazards will meet ALARA.

#### **11.4.1 Removing Dangerous Waste**

Any residue remaining in the WRS and DBVS piping and equipment will be removed during decontamination and managed as mixed waste. In response to OSWER Guidance Manual, Section 4.9.1(2), the maximum quantity of tank waste in storage and/or treatment at any given time during the active life of the facility will be the storage quantities noted in Table 1-2 plus

untreated bounding waste quantities of 7,240 kg (15,970 lb) in the mixer/dryer and 57,940 kg (127,720 lb) of waste in one container awaiting vitrification.

#### **11.4.2 Decontaminating Structures, Equipment, and Soil**

Structures and equipment anticipated to be contaminated at the start of the closure period include tank and pipe surfaces, ancillary equipment, and concrete containment structures.

Decontamination technologies will be selected based on demonstrated effectiveness in a radioactive environment and the ability to successfully achieve the closure performance standards.

Specific methods of decontamination for the treatment unit components and equipment will be determined at the time of closure. These methods will be based on information in the operating record, existing radiation levels, and ORP plans for future use, if any, of the equipment.

Air emission control equipment will remain in-place and in operation as necessary to facilitate treatment equipment deactivation and decontamination. Equipment will be taken out of service in stages as contamination is progressively removed or reduced. Compliance with applicable air emission standards will be maintained. Air permits in place during the operational phase will be reviewed to determine applicability during the closure period and modified as necessary per applicable regulations.

#### **11.4.3 Sampling and Analysis to Identify Extent of Decontamination/Removal and to Verify Achievement of Closure Standard**

The Sampling and Analysis Plan (SAP) will describe the approach to be followed for confirming that decontamination and/or removal activities have attained the closure performance standard. Prior to closure, this closure plan will be revised to specify sampling and analysis techniques in the Test and Demonstration Facility SAP.

The SAP will be prepared to evaluate the extent of soil contamination and the effectiveness of decontamination at the Test and Demonstration Facility site.

Sections will include:

- **Sampling Objectives.** Sampling will be conducted to evaluate the extent of contamination and the decontamination effectiveness at the Test and Demonstration Facility.
- **Analytical Parameters.** Analytical parameters, methods, and specific analytical and sampling procedures will be based on knowledge of the operations and wastes processed (i.e., process knowledge) in the Test and Demonstration Facility. A list of indicator parameters or Contaminants of Concern (COCs) will be developed based on potential COCs present and the closure performance standard (designation and/or risk-based limits). The analyses will follow the methods described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846) and/or other approved methods.

- 1 • **Sampling Methods.** Sampling will be performed in a manner consistent with EPA and  
2 Ecology guidelines:
  - 3 – Quality Assurance/Quality Control Guidance for Removal Activities: Sampling and  
4 QA/QC Plan and Data Validation Procedures, Interim Final (EPA 1990)
  - 5 – Guidance on Sampling and Data Analysis Methods (Ecology 1995).
- 6 • **Sampling Equipment, Containers, and Preservation.** The sampling equipment  
7 containers, and sample preservation techniques will be in accordance with procedures  
8 outlined in *Test Methods for Evaluating Solid Waste, Physical Chemical Methods*  
9 (EPA 1986).
- 10 • **Chain-of-Custody Record.** The chain-of-custody record will ensure the integrity of the  
11 samples, from collection through analysis to final disposition.

## 12 11.5 SCHEDULE FOR CLOSURE

13 A closure date has been tentatively identified in Figure 1-2, Proposed Project Schedule, for the  
14 Test and Demonstration Facility. A detailed closure schedule will be developed and submitted  
15 prior to facility closure. If closure plan modifications are necessary to achieve clean closure, a  
16 revised schedule will be proposed as part of the permit modification package.

## 17 11.6 CERTIFICATION OF CLOSURE

18 Within 60 days of completion of closure activities for the facility, a copy of the closure  
19 certification, signed by the owner/operator, contractor representative, and an Independent  
20 Qualified Registered Professional Engineer, will be transmitted, via registered mail, to Ecology  
21 and placed in the administrative record. Figure 11-1 presents a sample Closure Certification  
22 Statement. The certification of closure will cover only the portions of the facility covered by the  
23 closure activities proposed. The certification will occur upon disposition of waste generated  
24 from decontamination and completion of closure activities. The Independent Qualified  
25 Registered Professional Engineer will provide a signed statement that meets the applicable  
26 requirements of WAC 173-303-610(6), certifying that the closure activities were performed in  
27 accordance with the technical specifications of the approved closure plan for the facility.

Figure 11-1. Sample Closure Certification Statement

<b>CLOSURE CERTIFICATION</b>		
<b>FOR</b>		
<b>BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY</b>		
<b>Hanford Site</b>		
<b>U.S. Department of Energy</b>		
<p>We, the undersigned, hereby certify that closure activities for the Bulk Vitrification Test and Demonstration Facility were performed in accordance with the specifications in the approved closure plan.</p>		
_____ Owner/Operator	_____ Signature	_____ Date
_____ Contractor Representative	_____ Signature	_____ Date
_____ Independent Qualified Registered Professional Engineer	_____ Signature	_____ Date
Washington State PE No. _____		

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# **PERMIT ATTACHMENT FF**

**Emergency Preparedness and Prevention – Following  
Sections of The Permit Application:**

<b>Section 2.0</b>	<b>Facility Description</b>
<b>Section 4.0</b>	<b>Bulk Vitrification Test and Demonstration Facility</b>
<b>Section 5.0</b>	<b>Operations Plan</b>

**Permit Number: WA 7890008967**

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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## **Section 2.0**

# **Facility Description**

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## 2.0 FACILITY DESCRIPTION

### 2.1 FACILITY SITING

The planned site location for the Test and Demonstration Facility is shown in Figure 2-1. The site is located immediately west of the 241-S Tank Farm in the 200 West Area of the Hanford Site. The wastes planned for treatment are currently stored in Tank 241-S-109; a 2,839,050-L (750,000-gal) SST located in the 200 West Area. The waste from Tank 241-S-109 will be transferred to a waste staging tank and/or waste receipt tank(s) at the planned Test and Demonstration Facility location after pretreatment.

The site is west of the existing 241-S Tank Farm fence in an already disturbed area and will support process and ancillary equipment for the DBVS. The proposed location allows close access to existing electrical and raw water utilities, telephone, and Hanford local area network services. Surface materials consist of soft sand and soil that are free from surface contamination. The site is sufficiently level to provide for equipment placement with minimum grading or excavation. Cooper Avenue, running north-south on the west side of the 241-S Tank Farm, provides ingress and egress to the area.

### 2.2 PHYSICAL PLANT

The Test and Demonstration Facility (Figures 2-2 and 2-3) will make use of existing infrastructure to the maximum extent possible. Because of the unit-specific installation, operational, and closure needs of the DBVS, some infrastructure elements may be modified, augmented, or added. Potential infrastructure elements include:

- Utilities (water, electric power, sewer, steam)
- Communications (telephone and computer)
- Roadways
- Radioactive material containment
- Hazardous material containment
- Secondary waste storage/transfer systems
- Treated waste storage/transfer systems.

Facility security provisions and signage will comply with applicable portions of WAC 173-303-310.

#### 2.2.1 Bulk Vitrification System Components

The DBVS consists of trailer-mounted and skid-mounted equipment suitable for field installation, operation, and removal at the completion of the project. The system includes the major components, systems, and areas listed below, which are described in detail in Section 4.0.

The general arrangement of the following components for Phase 1 and for Phase 2 (Figures 2-2 and 2-3) includes:

- Waste retrieval system
- Waste staging tank and pumps
- Waste receipt tanks and pumps
- Process additive storage/handling
- Waste feed preparation (mixer/dryer)
- Vitrification container preparation system
- In-container vitrification (ICV<sup>®</sup>) system
- Electrical equipment
- Offgas treatment system
- Control and data acquisition system
- ILAW storage
- Secondary waste storage and handling (containers or tanks).

### **2.2.2 Support Systems**

Support systems are systems that are required to operate the DBVS, but are not directly involved with the process. The support systems consist of:

- Control station
- Personnel contamination control and survey station
- Personnel rest areas (e.g., lunch room and restrooms)
- Change room
- Safety showers and eye wash stations
- Backup generator.

## **2.3 WASTE CHARACTERISTICS, RETRIEVAL/STORAGE, AND TRANSFER**

### **2.3.1 Waste Characteristics**

The waste in Tank 241-S-109 is stratified. In the bottom of the tank is a layer of sludge. On top of the sludge is a mixed saltcake solid and liquid layer and the top layer is drained saltcake. The salt cake waste is the source waste material for the Test and Demonstration Facility. Some characterization of the waste in Tank 241-S-109 was previously conducted. Characterization results represent the Best Basis Inventory (BBI) for the liquid and saltcake fraction of the tank waste. A detailed discussion of the waste characteristics is located in Section 6.2.

### 2.3.2 Waste Retrieval and Storage

The retrieval detail for Tank 241-S-109 is presented in RPP-18812, *Tank S-109 Partial Retrieval Functions and Requirements*, and has been submitted to Ecology for approval of the retrieval process.

There will be a difference in the retrieval of waste from Tank 241-S-109 and its transfer to the DBVS between Phases 1 and 2 of the program. During Phase 1, waste from Tank S-109 will be routed through a solids/liquid hydroclone separator and sensing instruments to a staging tank that will hold 3,780 L (1,000 gal) of material (Figure 2-4). The sensing instruments will provide process control or waste characterization information. Staging tank discharge will be pumped to either a DBVS waste receipt tank or, if not suitable for processing in the DBVS, to the DST system.

During Phase 2 the waste will be transferred directly to the waste receipt tanks. The transfer route will go through the solids/liquid hydroclone separator and sensing instrumentation, but bypass the 3,780 L (1,000 gal) waste staging tank (Figure 2-4).

The Test and Demonstration Facility will accept tank waste into waste receipt tanks with capacities shown in Table 2-1.

**Table 2-1. Waste Receipt Tank Capacity**

Phase	Number of Tanks	Capacity	Total Capacity
1	1	3,780 L (1,000 gal)	3,780 L (1,000 gal)
2	4	68,140 L (18,000 gal)	272,160 L (72,000 gal)

All waste storage tanks and containers including the waste staging tank and waste receipt tanks will be properly and legibly marked in accordance with the requirements of WAC 173-303-395(6). Containers will be managed in accordance with the requirements of WAC 173-303-630. All waste tank systems will comply with the design, installation, and operating requirements of WAC 173-303-640, as applicable. Tank system materials of construction will be selected with appropriate consideration for the corrosion potential of the materials stored and process conditions.

Secondary containment will be provided for all tanks in the form of double-walled tankage or containment structures with sumps. Containment provisions will be designed and constructed for compliance with WAC 173-303-640(4).

During Phase 1, the waste staging tank and waste receipt tank will be double shell tanks or placed in containment structures with sumps (Figures 2-2 and 2-3). For Phase 2, the waste staging tank will be bypassed but will either remain in its structure or be removed and decontaminated in compliance with the Test and Demonstration Facility closure plan (Section 11.0).

### 2.3.3 Waste Transfer

Waste transfer will be in the form of waterborne salt solution. Waste left in a waste receipt tank at the end of a campaign may be transferred to another tank and mixed with incoming waste for processing. A waste transfer line water flush may be made after each batch transfer of waste feed, as needed. Waste transfer will occur only after verification that all systems are ready for the transfer/receipt of waste. The vitrification station will be located beneath the dried waste hoppers for gravity feed of waste to the container. The mixer/dryer, vitrification, cooldown, and tophoff/survey stations will be provided with radiation shielding and spill containment curbs.

Secondary containment will be provided for liquid waste transfer operations in the form of hose-in-hose or pipe-in-pipe transfer lines. Dried waste transfer from the mixer/dryer to the hopper will have secondary containment. Dried waste transfer from the hopper to the container will be conducted inside a removable hood sealed to the container top. Cleanup of spills within the hood will be performed using a containment system.

### 2.4 TREATED WASTE PACKAGING

Containers of treated waste resulting from the bulk vitrification process will be placed in a dedicated temporary storage area at the Test and Demonstration Facility site (Figure 2-2) during the RD&D permit duration. By generating immobilized treated waste directly in the container, the treatment container also serves as the final disposal container. The storage area will be designed to hold all containers of treated waste generated during the project. The storage area will meet the provisions of WAC 173-303-630(7)(c)(i) and (ii) which are applicable for storage areas that store containers holding only wastes that do not contain free liquids (i.e., the bulk vitrification waste containers):

- (i) *The storage area is sloped or otherwise designed and operated to drain and remove liquid resulting from precipitation; or*
- (ii) *The containers are elevated or are otherwise protected from contact with accumulated liquids.*

All containers, handling procedures, and handling equipment will meet the waste acceptance criteria of the accepting disposal facility. Final disposal of treated waste will be at a permitted Hanford Site facility.

### 2.5 NON-REGULATED MATERIALS/SYSTEMS

Information provided in the following sections is general in nature and represents the minimum considerations for handling of non-regulated materials. Management of specific materials related to DBVS operation is discussed in Section 4.0.

#### 2.5.1 Potable Water

Water for process use will be transported by tanker truck to the Test and Demonstration Facility. The water source will provide settled river water or potable water. Backflow prevention will be provided to prevent the backflow of potable water to the tanker truck by utilizing an air gap as

1 the backflow mechanism, or other approved backflow prevention device, as applicable.  
2 Backflow prevention devices will be Washington State-certified models accessible for inspection  
3 by a water purveyor in a non-radiological zone.

4 Administrative and engineering controls (e.g., scheduled inspections, containment pads and  
5 curbs) will be in place to avoid spillage of water (which could potentially result in the  
6 mobilization of contaminants in the vadose zone).

## 7 **2.5.2 Raw Materials, Process Additives, and Consumables**

8 Raw materials, process additives, and other consumable materials will be stored in tanks,  
9 containers, or bulk storage in the Test and Demonstration Facility (Figure 2-2). Storage and  
10 delivery systems will be designed to accommodate the ingress and egress of trucks delivering  
11 raw materials and consumables. This accommodation may be composed of docks or stockpiles  
12 that allow for ease of loading/off-loading of the materials and consumables. Soil storage may be  
13 provided by a hopper truck with pneumatic conveying of soil to the DBVS during both phases.  
14 For Phase 2, a soil stockpile may be used in lieu of the hopper truck due to the higher usage rate  
15 of soil. Refractory sand will be stored in a stockpile for both phases. Other process additives  
16 will be stored in containers. The design and location of the loading/off-loading areas will be  
17 compatible with existing Hanford Site roadways and/or other roadways added for the planned  
18 Test and Demonstration Facility.

## 19 **2.5.3 Electric Power System**

20 Under normal operating conditions, all electric power for the Test and Demonstration Facility  
21 will be obtained from the Hanford Site grid through a local transformer. A backup generator will  
22 be located at the site to provide power in the event grid power is lost. The backup generator will  
23 have about a 1,200-kilowatt total load rating. The generator will be diesel-powered. A 37,850-L  
24 (10,000-gal) diesel fuel storage tank will be provided for the generator drive motor.

25 The backup generator is capable of powering the Test and Demonstration Facility systems with  
26 480 volt loads on a continuous basis. However, it will be intended only for use in continuous  
27 operation of the offgas treatment system, system pumps, the control system, and other  
28 electrically-operated equipment needed for a controlled system shutdown in the event of a power  
29 outage and achieving full system shutdown until power from the Hanford Site grid can be  
30 restored.

## 31 **2.6 SECONDARY WASTES**

32 A variety of secondary wastes may be generated during the planned project. This section covers  
33 general requirements for management of expected secondary wastes. Details are provided in  
34 Section 4.0.

35 Secondary waste streams such as liquid effluent will be disposed of in the Liquid Effluent  
36 Retention Facility, the Effluent Treatment Facility (ETF), or the 200 Area Treated Effluent  
37 Disposal Facility, as appropriate. Disposition of solid waste streams will be managed in  
38 accordance with HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, and the waste  
39 acceptance criteria of the receiving facility, as necessary. Disposition of secondary liquid

effluent waste streams will be managed in accordance with HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*, and the acceptance criteria of the receiving facility, as necessary.

Dedicated tanks will be provided for onsite liquid waste storage pending sampling and transfer to a treatment facility. It is anticipated that up to ten 68,140L (18,000 gal) tanks may be used. The actual capacity and number of tanks will be determined during the DBVS project. Tank systems will comply with the applicable portions of WAC 173-303-640.

Storage tank capacity requirements are based on the following assumptions:

- Dryer condensate =  $3.40 \text{ gpm} \times 60 \text{ min/hr} \times 7.9 \text{ hr/dryer batch} \times 8 \text{ dryer batches} \approx 12,900 \text{ gal}$
- Quench blowdown =  $2.39 \text{ gpm} \times 60 \text{ min/hr} \times 168 \text{ hr/ICV batch} \approx 24,100 \text{ gal}$
- Tri-Mer Scrubber blowdown<sup>1</sup> =  $4.29 \text{ gpm} \times 60 \text{ min/hr} \times 200 \text{ hr/ICV batch} \approx 51,500 \text{ gal}$
- Total flow to ETF per ICV container  $\approx 88,500 \text{ gal per container}$ .

Offgas treatment system equipment designs will comply with the applicable requirements of WAC 173-400, 173-401, 173-460, WAC 246-247, and ASME AG-1, *Code on Nuclear Air and Gas Treatment*. The design of the gaseous and particulate effluent monitoring system will comply with ANSI/HPS N13.1, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*. The process equipment will interface with systems that transport secondary waste to appropriate locations.

## **2.7 IGNITABLE, REACTIVE, AND/OR INCOMPATIBLE MATERIALS**

In the course of the RD&D project, it is unlikely that tank waste batches will be received that are incompatible with other materials present in the facility, especially process additives. DOE has identified flammable/toxic gases as a potential waste incompatibility. Incompatibilities will be addressed in DOE safety documentation to comply with WAC 173-303-395. Process knowledge, process history, pertinent literature on waste chemistry and tank history and waste analysis will be used to address the Dangerous Waste Codes D001 (Ignitability), D002 (Corrosivity), and D003 (Reactivity) for the waste before transfer to the Test and Demonstration Facility. Verification sampling to document the absence of characteristic codes will be performed on the first batch of retrieved waste as part of the WRS prior to transfer to the DBVS waste receipt tank.

## **2.8 OCCUPATIONAL SAFETY AND HEALTH**

All buildings, structures, and equipment utilized in the planned project will incorporate design features that comply with applicable subparts of Occupational Safety and Health Administration (OSHA) Regulation 29 CFR 1910, "Occupational Safety and Health Standards."

<sup>1</sup> Only if used as a backup to the SCR.

## **Section 4.0**

# **Bulk Vitrification Test and Demonstration Facility**

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## **4.0 BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY**

The DBVS treatment equipment will be installed and operated under two phases as described in Section 1.7.1. The scope and conduct of the phased operation is described in detail in Section 5.0. Unless otherwise stated, the configuration and operation described are consistent with Phase 2 activities.

### **4.1 TECHNOLOGY-SPECIFIC GOALS AND OBJECTIVES**

The primary purpose of testing the DBVS is to fully demonstrate the bulk vitrification process on Hanford tank waste while meeting the project objectives listed in Section 1.5 and assuring protection of human health and the environment. In terms of technology-specific assessment goals and objectives, the DBVS must also demonstrate its ability to perform effectively while:

- Preventing the release of contaminants into the environment during processing
- Preventing exposure of plant operating personnel to hazardous process streams
- Minimizing the production of secondary waste streams.

### **4.2 PROCESS AND EQUIPMENT DESCRIPTION**

The primary technology to be used for the DBVS is an ICV® process. Process flow diagrams for both phases of the RD&D project are provided in Appendix B. Process operation is essentially the same for both phases.

The salt solution is retrieved from Tank 241-S-109, subjected to pretreatment as required (Section 1.7.3), and transferred to the waste receipt tank(s). The waste is mixed with glass formers in a mixer/dryer unit and dried prior to being transferred to the ICV® containers (Section 4.2.8). Transfer of the dried waste mixture is accomplished through ports in the container lid.

The ICV® container is prepared before the waste mixture is transferred to the container. Preparation of the ICV® container includes lining the container with refractory materials that will be selected based on successful testing/operation at the range of process temperatures expected. Refractory material will include cast material and sand as noted in Appendix F. The electrodes are then mounted on the container lid. The lid is lowered onto the container with a refractory gasket sealing the lid to the container, bolted in place, and the offgas ductwork is connected. Once the ICV® container is prepared, the waste mixture is added from the mixer/dryer in batches.

The waste mixture is vitrified by resistive heating caused by electrical resistance of soil and waste. The heating cycle lasts for approximately 130 hours.<sup>1</sup> Vitrification emissions are routed to an offgas treatment system (Section 4.2.12).

After completion of the vitrification process (Section 4.2.11), fill material (e.g., sand) will be added to fill the void container volume and provide a sufficient fill fraction (>90% by volume)

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<sup>1</sup> Total container processing time, including waste mixing/drying, container fill, connection hookup, etc., is approximately 168 hours or one operating week.

for container landfill disposal. The vitrified waste will undergo cooling, sampling, and external decontamination as required. Final cooling may occur at designated cooling stations along the process line or at an interim storage location on the Test and Demonstration Facility site. Core samples may be removed through ports in the container for analysis and testing. Test results will be used to support waste form qualification, risk assessment, and performance assessment. A composite core sample (e.g., vitrified material, sand, and refractory material) will be evaluated for compliance with LDR, as noted in Section 6.0.

#### 4.2.1 System Capacity

The feed rate to the mixer/dryer may be varied as one of the parameters being evaluated through this demonstration project. During Phase 1, up to three test runs will be performed to conduct systems verification and initial waste treatment using approximately 1,135 L (300 gal) of tank waste per container. The amount of waste introduced into each container will be varied during Phase 2 in order to investigate the effect of waste loading on processing time, electric power usage, etc. Over the entire series of test campaigns in Phase 2, the average waste material volume used per test will be approximately 58,080 L (15,345 gal) of a 5 M salt solution. However, individual campaigns may be conducted using up to 76,540 L (20,220 gal) of a 5 M salt solution in a container load.

#### 4.2.2 Waste Retrieval System

As noted in Section 2.3.2, the WRS will provide waste feed from Tank 241-S-109 to the DBVS in two distinct phases. During Phase 1, a limited quantity of waste is planned to be provided to the DBVS. During this phase, the quantity of waste will be limited within the facility such that the facility will be classified as below a Hazard Category-3 radiological facility as defined in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. During Phase 2, the quantity of waste to the facility will be increased such that the facility will be classified as a Hazard Category-2 facility. The qualitative definition of a Hazard Category-2 facility is that the hazard analysis shows the potential for only significant localized consequences.

During Phase 1, waste transfer will occur through a Waste Staging Tank Skid, which will include the following safety features:

- Leak detection - The skid will perform a secondary containment role. If there are any leaks in the staging tank, piping, fittings, etc, within this skid, the skid will contain the leak. A leak detection sensor located on the floor of the skid will detect the leak and activate an alarm system. Any material leaked into the skid will be routed back to either Tank 241-S-109 or to the DST system.
- Waste staging tank ventilation - The waste staging tank and the containment structure will be "passively vented" to atmosphere through high-efficiency particulate air (HEPA) filter(s).
- Tank overflow protection - A tank overflow detector will be provided, with remote indication that the tank level has been exceeded. An overflow line will also be provided to direct the overflowing waste to the floor of the skid. As mentioned above, if this

“faulted condition” occurs, the leak detection system will identify the situation and waste transfer operations can be stopped.

- Sampling port - A sampling port will be provided on the top of the waste staging tank to allow waste samples to be withdrawn from the tank for analysis.
- “Bad batch disposal”- If the waste staging tank’s contents are found not to be within the acceptable specification for acceptance to the DBVS, the waste batch will be sent to the DST system. The waste retrieval pump can be valved to send out-of-specification waste back into the transfer line to Tank 241-S-109, and via the 3-way valve in the pump pit, to the SY Farm Waste Retrieval Receiver Tank.

**4.2.2.1 Phase 1 Activities.** During Phase 1, waste from Tank 241-S-109 will be sent to a double-wall staging tank that will hold 3,780 L (1,000 gal) of waste. A retrieval pump will be used to remove waste from Tank 241-S-109 and transfer it to the staging tank. It is anticipated that the waste transfer pump will be a jet pumping system similar to the ones used for saltwell pumping on the Hanford Site and that the transfer rate will be between 19 L/min and 28 L/min (5 - 10 gpm). The pump, solids/liquid separator, and the sensing systems noted in the following paragraphs will be located in a pump pit containment structure adjacent to Tank 241-S-109.

The pump suction will be screened to prevent entrainment of solid particles in the pump inlet stream. The pump discharge will be routed through a solids/liquid hydroclone separator capable of reducing the waste stream solids content to 3% or less. Hydroclone separator devices use a tangential inflow to a vertical cylindrical vessel creating a spiral flow path for the liquid, using centrifugal forces to remove solid particles from the flow stream and move them outwards to the vessel walls. The dispersed particles move downward under gravity into a cone-shaped collection chamber, while the purified liquid moves upward to the center of the unit to a top mounted outlet. The unit is usually equipped with an airlock on the collection chamber to maintain pressure drop across the unit without drawing in ambient air. This filtration system will have the capability to be flushed back to Tank 241-S-109 and/or be replaced, if the differential pressure across it exceeds the allowable value.

From the solids/liquid hydroclone separator, the filtered waste will be monitored by sensing instruments to provide process control over waste transfer or waste characteristic information. Waste transfer process control will be based on the results of waste sampling and analysis. The proposed instruments to be included in this system are:

- A flow meter capable of indicating the specific gravity and flow rate of the waste.
- A chemical speciation probe.<sup>1</sup> This is an experimental device being developed by Pacific Northwest National Laboratory that will utilize Raman technology to provide scientific information on the chemical speciation of the waste.
- A conductivity probe. This device will provide information on the waste conductivity. The conductivity probe is planned to be a process control device.
- An optional gamma radiation monitor.

<sup>1</sup> Due to the experimental nature of this probe, it will not be used for regulatory compliance purposes.

1 A three-way valve will direct waste to either the waste staging tank or, if the waste does not meet  
2 the waste acceptance criteria noted in Section 6.0, to the DST system for storage and eventual  
3 disposal. The waste transfer piping from pump pit to either of these locations will be through a  
4 hose-in-hose-transfer line (HIHTL) and will be equipped with an optional on-line radiation  
5 monitoring system which will continuously measure the quantity of Cs-137 being transferred  
6 through the HIHTL.

7 Initial waste retrieval during Phase 1 will direct waste to the DST system. CH2M HILL Process  
8 Engineering personnel will monitor the transfer data, while waste is being sent to the SY tank  
9 farm and determine when to route the waste stream to the waste staging tank. When the waste  
10 characteristics are deemed acceptable for processing, the three-way valve in the pump pit will be  
11 positioned to send waste to the waste staging tank.

12 The waste staging tank will have only one inlet/outlet combination. While transferring waste  
13 from Tank 241-S-109 to the waste staging tank, the tank will be connected to Tank 241-S-109  
14 via a HIHTL. With this design, the system is physically disconnected from the DBVS facility  
15 when the waste staging tank is being filled with waste. Once the waste staging tank is filled the  
16 waste batch is characterized. When it has been verified that the waste meets the DBVS waste  
17 acceptance criteria the HIHTL connecting the waste staging tank and Tank 241-S-109 will be  
18 disconnected. The HIHTL from the DBVS facility will then be connected to the same connector  
19 on the waste staging tank. The contents of the waste staging tank will then be pumped to the  
20 DBVS receiver tank, via this HIHTL that will exit the farm, go under Cooper Avenue, and mate  
21 up with a receiver skid at the DBVS facility.

22 If analysis of tank contents determines that the waste batch is not acceptable for processing, it  
23 will be routed to the DST system.

24 **4.2.2.2 Phase 2 Activities.** During Phase 2, the "segmentation" concept from Phase 1 will no  
25 longer be required since the DBVS Facility will be a Hazard Category-2 facility. Waste transfer  
26 rates will be increased to an anticipated 76 L/min (20 gpm). The waste tank can, and will be,  
27 directly connected to the DBVS facility. The transfer route from Tank 241-S-109 to DBVS will  
28 bypass the waste staging tank skid. The solids/liquid separator and the sensing instrumentation  
29 will be retained but the solids/liquid separator capacity will be increased to accommodate the  
30 increased waste flow rate.

### 31 **4.2.3 Waste Receipt and Storage**

32 The WRS transfers waste into waste receipt tank(s) for process feed, storage, and sampling. The  
33 waste received will be stored in tanks as noted in Table 2-1. Tank capacities are based on  
34 anticipated waste processing rates described in Sections 1.7.5 and 4.2.1. All waste storage tanks  
35 will be double-wall construction with HIHTL and leak detection provisions. Waste tanks will be  
36 vented through the offgas treatment system (Sections 4.2.15 and 4.2.16).

37 A single 3,780-L (1,000-gal) waste receipt tank will be used during Phase 1 because the total  
38 amount of waste treated in the initial campaigns will be minimal. The use of a small tank will  
39 limit the amount of waste stored during Phase 1 to an amount below Hazard Category-3  
40 requirements.

1 At the completion of Phase 1, the 3,780-L (1,000-gal) storage tank may be retained and used for  
2 storage of process additives such as simulated waste materials (simulants) or spiking agents  
3 during Phase 2 if allowed after flushing and inspection to clean debris standards. Additional  
4 waste receipt tanks (Section 2.3.2 and Table 2-1) will be installed for Phase 2. The additional  
5 tanks will be installed so that one or more tanks can be used to provide waste feed for treatment  
6 while the other tanks are being filled and sampled as described in Section 6.0. In order to ensure  
7 that a consistent feed rate of waste material is delivered to the treatment system, each waste  
8 receipt tank is sized so that its contents are sufficient to supply more than the anticipated waste  
9 demand rate to the DBVS.

#### 10 **4.2.4 Process Additives**

11 The DBVS will use soil, waste simulants, glass additives, offgas treatment chemicals, and other  
12 materials as process additives. Table 4-1 contains a summary of these materials, their storage  
13 methods, and uses. Soil will be used to form the matrix for the vitrification process and to add  
14 an additional layer of clean material on the vitrified mass in the container. Waste simulants will  
15 be used for running system verification tests prior to treatment of actual SST waste during Phase  
16 1 and as "filler" to attain the required process material volume (waste plus simulant) for a given  
17 test campaign during testing in both phases. Waste simulants could include spiking agents for  
18 specific process performance testing purposes. The majority, estimated at seventy-five percent  
19 (75%) of simulants will be used in Phase 1. A 68,140-L (18,000-gal) double-wall tank will be  
20 used for simulant storage during this phase. This tank may be retained onsite for use as one of  
21 the waste storage tanks for Phase 2 operations or may be removed from the site at the completion  
22 of Phase 1. Process additives will be kept in dedicated storage areas segregated from regulated  
23 waste storage to minimize the possibility of contamination. Residual simulant material not used  
24 in Phase 2 will be analyzed for dangerous waste characteristics and, if designated as dangerous  
25 waste, will be managed in accordance with standard Hanford Site procedures.

26 Graphite will be placed in the vitrification container to help initiate the soil/waste melting  
27 process. Boron and zirconium will be used in small quantities (approximately 2,100 kg  
28 (4,630 lbs) and 3,000 kg (6,615 lbs) per container load, respectively) to optimize glass  
29 performance. Sand will be used as an insulator.

#### 30 **4.2.5 Dry Material Handling**

31 Dry materials will be stored and either conveyed or transferred in bulk from various process  
32 staging areas to equipment within the DBVS. Depending on the material characteristics and the  
33 amounts used, the additives may be stored in tanks, containers, or in bulk (stockpiles) compliant  
34 with applicable regulatory requirements.

35 During Phase 1, the amount of soil required for the vitrification matrix will be limited. The soil  
36 will be stored in an onsite hopper for pneumatic conveying to the treatment system. A similar  
37 arrangement may be provided for Phase 2, or, depending on the soil usage rate, a stockpile may  
38 be maintained. The loading point for soil into the treatment system will be equipped with  
39 parallel storage silos and a baghouse air pollution control system. For stockpiles, engineering  
40 controls for dust suppression will be implemented.

**Table 4-1. Process Additives Information**

Additive	Form	Storage Method	Use	Point of Introduction
Soil	Solid	Hopper (Phase 1) Hopper stockpile (Phase 2)	Vitrification matrix, container tophoff	Dryer
Sand	Solid	Stockpile	Insulating material	ICV container
Waste simulants	Solid/slurry	Tank	Waste material substitute; "spiking agents"	Waste receipt tank, dryer
Graphite	Solid	Containers	Vitrification aid	ICV container
Boron	Solid	Containers	Glass performance aid	Dryer
Zirconium	Solid	Containers	Glass performance aid	Dryer
Water	Liquid	Tank	Air pollution control	Quench unit, venturi scrubber, Tri-Mer scrubber
Ammonia	Gas	Pressurized tanker	Air pollution control	Selective catalytic reduction
Sulfuric acid	Liquid	Containers	Air pollution control	Tri-Mer scrubber
Sodium chlorate	Liquid	Containers	Air pollution control	Tri-Mer scrubber
Sodium sulfide	Liquid	Containers	Air pollution control	Tri-Mer scrubber
Sodium hydroxide	Liquid	Containers	Air pollution control	Tri-Mer scrubber

#### 4.2.6 Liquid Material Handling

Liquid materials other than waste feed will be used during DBVS operations. These include water and scrubbing chemicals. Water will be provided directly from tanker trucks. Other liquid material used will either be stored in portable tanks or in containers (e.g., carboys, drums) depending on the material handling requirements and/or the quantity used. Materials stored in portable tanks will be replenished either by removal and replacement of the tank or refilling from a tanker. Liquid chemical storage areas will be provided with suitable spill containment provisions.

#### 4.2.7 Gaseous Material Handling

As an integral part of a best available control technology program, ammonia will be used as an air pollution control aid for removal of oxides of nitrogen (NO<sub>x</sub>). The gas will be supplied from

1 a pressurized liquid ammonia tanker truck. Ammonia will be vaporized and injected into the  
2 offgas stream to ensure proper mixing and efficient NO<sub>x</sub> scrubbing.

#### 3 **4.2.8 Waste Feed Preparation**

4 Before the vitrification process begins, the waste material will be mixed with additives and dried  
5 to remove moisture in a batch-mode rotary mixer/dryer. The unit will be indirect-heated by  
6 steam from a diesel-fired onsite boiler. The boiler is a closed-loop system. Waste material will  
7 be pumped from waste receipt storage tanks. Appropriate additives will be conveyed or  
8 transferred to the unit. The dry material transfer systems will be equipped with weigh stations to  
9 control the amount of material being added to the dryer.

10 The mixer/dryer fill capacity for waste salt solution and process additives is 10,000 L (2,645 gal)  
11 at a nominal fill fraction of 45 to 50% (48.4% is the measured fraction from testing). The  
12 nominal drying cycle time is eight hours but may be as short as six hours for relatively dry  
13 incoming waste. During the mixing/drying cycle, the unit will be maintained under vacuum to  
14 promote the release of moisture from the material being processed at a reduced temperature. The  
15 moisture content of the material will be monitored by a load cell on the unit (noting the weight of  
16 moisture removed) and a moisture sensor in the exhaust duct. Discharge of dried material to the  
17 waste container will be vacuum transferred to feed hoppers and then gravity fed through an  
18 enclosed chute with shutoff valves. The amount of waste transferred will be determined from  
19 mixer/dryer load cell readings.

20 Mixer/dryer offgases will be treated to remove moisture before being routed to the main offgas  
21 treatment system for additional emission control.

#### 22 **4.2.9 Vitrification Container Preparation**

23 The typical waste container for the vitrification process is expected to be a steel box  
24 approximately 3.0 m (10 ft) high, 2.4 m (8 ft) wide, and 7.3 m (24 ft) long. Containers will  
25 comply with the waste acceptance criteria for the receiving TSD unit (a permitted Hanford Site  
26 facility). Prior to waste distribution, the container will be lined with insulating board, sand, and a  
27 layer of castable refractory. The castable refractory (Appendix F) will face the waste material.  
28 A layer of melt-initiating graphite and soil will be placed over the castable refractory in the  
29 bottom of the container. The container will contain a port(s) for sampling the vitrified waste to  
30 obtain samples for analyses listed in Section 6.0.

31 A steel lid with attached electrodes will be sealed onto the container prior to waste deposition  
32 using bolted flanges and a refractory gasket. The lid contains several ports for waste material  
33 addition, electrode connections, venting, sampling, and introduction of post-vitrification  
34 materials. All connections will be mechanically sealed to the container lid. In addition, waste  
35 transfer connections will be equipped with shutoff valves to prevent spillage of material as the  
36 chute is attached to and removed from the port. To minimize potential contamination to workers  
37 and the environment, the connection points will be equipped with secondary containment and  
38 spilled material recovery equipment during material transfer, melting, and cooldown.

39 Containment will consist of a ancillary waste transfer enclosure (AWTE) that seals to the  
40 container lid before waste is added to the container. The AWTE provides containment while the

1 waste and soil addition connections are made and during the melt process. The operator is able  
2 to access the waste and soil addition connections through glove ports in the AWTE. Once the  
3 melt is complete and the container is cool enough to add clean soil on the top, the AWTE will be  
4 removed to allow the container to move to the temporary storage area. The waste container  
5 filling/vitrification station will be equipped with shielding, as required.

#### 6 **4.2.10 In-Container Vitrification**

7 The waste mixture, including simulants and glass formers, from the mixer/dryer will be placed  
8 into the vitrification container through ports in the sealed container lid. Electric power will be  
9 applied to the electrodes, vitrifying the container contents via resistive heating to produce ILAW.  
10 The ILAW is the final RCRA waste form for disposal. Ambient air, filtered through a HEPA  
11 filter, is injected to assist in establishing and maintaining airflow through the container to the  
12 offgas treatment system, cool the vitrification offgases, and provide thermal protection for HEPA  
13 filters in the offgas treatment system. Vitrification offgases are vented under induced draft to the  
14 offgas treatment system. During the vitrification process, the depth of material will typically  
15 decrease due to consolidation in melting.

16 Both "bottom-up" and "top-down" melting may be conducted during testing to determine the  
17 most effective method of waste treatment. The current plans focus on the bottom-up melt  
18 procedure; however, there may be a need to perform top-down melting at some time during the  
19 testing process. Top-down melting is conducted by applying power to the electrodes only after  
20 all waste materials and process additives have been placed in the container. Bottom-up melting  
21 begins melting with a shallow layer of material in the container and continues as more material is  
22 added until the desired depth of melt is obtained.

#### 23 **4.2.11 Post-Vitrification Activities**

24 After vitrification has been completed, the container connection to the offgas treatment system  
25 will be maintained. Clean fill materials will be added to fill cavities around the electrodes and  
26 cover the top of the vitrified mass to minimize headspace in the container, creating a container  
27 that is at least 90% full.

28 Sampling of the vitrified waste, radiation surveying, and external decontamination (container  
29 wipedown, vacuuming of dust, etc.), as necessary, can be conducted any time after initial cooling  
30 has been completed. Sampling of the melt will be conducted by a coring process through a port  
31 in the side of the container. The method of sealing the sampling port during and after sampling  
32 has not been finalized. However, the port will be sealed in such a manner that the container  
33 remains in compliance with the RD&D Permit and the permitted storage/disposal facility waste  
34 acceptance criteria. Sampling protocol and methodology is addressed in Section 6.0. The data  
35 obtained will be used for waste form qualification, risk assessment, and performance assessment.

36 Temporary storage for up to 50 treated waste containers will be located at the north end of the  
37 Test and Demonstration Facility (Figure 2-2). At the completion of RD&D activities, the  
38 containers will be transported to the IDF or to another permitted Hanford Site storage/disposal  
39 facility.

#### 4.2.12 Offgas Treatment Requirements

Emissions may consist of either fugitive (i.e., bulk process additive loading and transfer) or point (i.e., stack) sources. Hazardous or radioactive emissions will not be released through fugitive sources, as those sources will be limited to nonhazardous and nonradioactive materials.

Emission calculations for all sources will utilize appropriate emission factors, source classification codes, or other information. Fugitive emissions, which will consist only of nonhazardous materials such as dust from process additive transfers, will be addressed in the *New Source Review Notification of Construction for the Supplemental Treatment Test and Demonstration Facility* (Schepens 2004).

Point sources may emit both nonradioactive and radioactive emissions. These sources will be equipped with a continuous emissions monitoring system (CEMS) that will monitor and record emissions of radionuclides (beta and gamma detectors) and those criteria pollutants (e.g., particulate matter, carbon monoxide [CO], NO<sub>x</sub>, and oxides of sulfur [SO<sub>x</sub>]) for which regulatory monitoring requirements exist and are included in the final emission source permit(s). The CEMS will be designed, installed, and operated in compliance with applicable portions of 40 CFR 60, Appendix B. The design of the gaseous and particulate effluent monitoring system will comply with ANSI/HPS N13.1, *Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities*. The CEMS data will be acquired in real time, but will be available for review in the form of periodically generated reports. Offgas treatment for DBVS operations will address the following issues:

- Particulate and gaseous emissions from waste receipt and storage
- Particulate emissions from process additive receipt, storage, and transfer (not including fugitive emissions from stockpiles)
- Particulate and gaseous emissions from mixer/dryer (dedicated partial system)
- Particulate and gaseous emissions from waste container filling and vitrification
- Particulate emissions from waste container topoff after vitrification.

All offgas treatment system connections to treatment equipment and the waste container tops will be sealed and the offgas ducting maintained under induced draft to prevent escape of pollutants.

With the exception of process additive management emissions, all emissions will be routed to an offgas treatment system prior to discharge to the atmosphere. Nominal efficiencies and the major pollutant controlled by the various offgas treatment system components used are provided in Table 4-2. Table 4-3 contains calculated removal efficiencies for major pollutants. Removal efficiencies were calculated using the Table 4-2 component efficiencies and the offgas treatment system arrangement in Appendix B. Appendix B contains additional information on the offgas treatment system components and efficiencies.

**Table 4-2. Offgas Treatment Component Efficiencies**

Component	Nominal Control Efficiency					
	Water/ Water Vapor	Organic Compounds	HCl	NO <sub>x</sub>	SO <sub>x</sub>	Particulate <sup>1</sup>
Baghouse	—	—	—	—	—	99%
Condenser	95 – 98%	50%	<10%	<10%	<10%	—
Mist Eliminator	10 – 25%	—	—	—	—	—
Sintered Metal Filter	—	—	—	—	—	99.5%
HEPA Filter	—	—	—	—	—	99.95%
Quench System	10 – 25%	10%	10%	10%	10%	10%
Packed Tower Scrubber (optional) <sup>2</sup>	—	90%	93%	93%	93%	<50%
Venturi Scrubber	—	25%	25%	25%	25%	95%
Selective Catalytic Reduction Unit(s)	—	—	—	99% <sup>3</sup>	—	—
Carbon Filter	—	95 – 99%	25%	25%	25%	—

<sup>1</sup> Particulate removal efficiencies are for ten-micron (10 µ) particle diameters and up. Removal efficiencies are based on AP-42 (EPA 1995), Appendix B.1, reference texts and process knowledge

<sup>2</sup> Efficiency range varies with pollutant adsorbed

<sup>3</sup> The selective catalytic reduction design goal is 99% efficiency

#### 4.2.13 Process Additive Emissions Control

Particulate emissions from offloading and transfer of process additives will be controlled by dedicated baghouse and vent systems. A covered hopper with a sealed pneumatic conveying system will be used to transfer soil to the mixer/dryer soil holding tank or silos. Particulate matter collected at the baghouses is returned to the appropriate additive storage area for reuse.

#### 4.2.14 Mixer/Dryer Offgas Emissions Control

The mixer/dryer emissions will be partially treated for moisture removal using a glycol-cooled condenser and mist eliminator prior to being routed to the main offgas treatment system. The partially treated offgases from this system will then be routed to the main offgas treatment system downstream of the chemical/venturi scrubber. Water condensed in the condenser and removed in the mist eliminator will be routed to a storage tank for sampling and subsequent treatment or disposal. Estimated rates and volumes of liquid secondary wastes generated from offgas emissions control system operations are provided in Section 2.6.

**Table 4-3. Pollutant Removal Efficiencies<sup>1</sup>**

Pollutant	Nominal Control Efficiency
Moisture	96%
Organic Compounds	98%
HCl	55%
NO <sub>x</sub>	99.95%
SO <sub>x</sub>	<50%
Particulate Matter	>99.9999%

<sup>1</sup> Based on arrangement of offgas treatment system components in Appendix B process flow diagrams

#### 4.2.15 Phase 1 Main Offgas Treatment System

The Phase 1 offgas treatment system will consist of two stages of sintered metal particulate filters, a glycol-cooled condenser, a quench section, one of two redundant atomizing chemical scrubber/venturi scrubber, mist eliminator system, additional stages of HEPA filtration and up to two independent NO<sub>x</sub> treatment devices.

Offgas from the melting process first passes through two stages of sintered metal particulate filtration. The purpose of the filters is to minimize radioactive contamination of downstream components to facilitate maintenance and operations. Dust collected from the sintered metal filters is recycled to the mixer/dryer. Dust from the final batch will be incorporated into the mixer/dryer where a final container using clean fill material will be processed to flush the system, and sent to the IDF or another permitted disposal facility. HEPA filters later in the system backup the sintered metal filters ensuring the particulate emissions are minimized.

After the sintered melt filters, the offgas passes through one of two redundant quenchers that cools the gas prior to introduction into the atomizing chemical scrubber/venturi scrubber. Either quencher can quench 100% of the offgas stream. In addition to quenching the offgas, the quencher augments the ability of the system to remove particulate matter and gaseous pollutants. Although this augmentation is not credited, it provides additional redundancy or capability to the offgas system.

Following the quencher, offgas is introduced into one of two redundant atomizing chemical venturi scrubbers. The atomizing chemical venturi scrubbers will be installed in parallel, with one in service and the other on standby. Either of the two atomizing chemical venturi scrubbers can scrub 100% of the offgas stream. Dilute sodium hydroxide will be injected in the atomizing scrubber section to reduce hydrogen chloride and other acid gas emissions. In addition to scrubbing hydrogen chloride and other acid gas emissions from the offgas, the scrubber augments the ability of the system to remove particles and NO<sub>x</sub>. This augmentation is not credited but occurs nonetheless and provides additional redundancy or capability to the offgas system.

Following the atomizing chemical venturi scrubber, offgases will pass through an additional condenser and one of two redundant mist eliminators, with drainage from those units routed to the scrubber recycle tanks. Condensed liquids are drained into the scrubber recycle tank. An offgas heater, parallel HEPA filters, and a carbon filter for radioactive iodine removal will follow the mist eliminator.

NO<sub>x</sub> treatment will be accomplished by a selective catalytic reduction (SCR) unit with a Tri-Mer packed tower scrubber as a back-up system. The packed tower unit consists of a quench unit and five towers in series that sequentially convert oxides of nitrogen to molecular nitrogen (N<sub>2</sub>) by reduction reactions with chemical reagents (H<sub>2</sub>SO<sub>4</sub>, NaClO<sub>2</sub>, NaS, and NaOH). Offgases will be discharged through a HEPA polishing filter, redundant exhaust blowers in parallel, and the system stack.

Reagents for the packed tower scrubber will be selected based on chemical species anticipated to be present in the offgases. Blowdown from the scrubber recycle tank will be sampled and routed to the ETF or other permitted Hanford Site facility for treatment and disposal.

Venturi scrubber blowdown contaminant types and their weight fractions/concentrations are provided in Table 4-4. If in service, the Tri-Mer packed tower will be used for only a portion of the vitrification cycle. Packed tower scrubber blowdown, also in the form of a continuous bleed stream, will be 16 L/min (4.29 gpm) and will produce approximately 194,950 L (51,500 gal) over the processing of a single waste container. Packed tower scrubber blowdown will consist of a sodium salt solution containing sulfates, sulfuric acid, sodium chlorite, sodium sulfide, sodium sulfite, sodium hydroxide, nitrates, and nitric acid. Carbon filters will be modular units rather than refillable contactors. Upon reaching saturation, the units will be removed, sampled, and disposed.

**Table 4-4. Scrubber Blowdown Contaminants**

Contaminant	Concentration
Sodium Hydroxide (NaOH)	2 % by weight
Sodium Nitrate (NaNO <sub>3</sub> )	13 % by weight
Sodium Carbonate (Na <sub>2</sub> CO <sub>3</sub> )	2.5 % by weight
Sodium Sulfite (Na <sub>2</sub> SO <sub>3</sub> )	0.5 % by weight
Sodium Chloride (NaCl)	0.02% by weight
Sodium Fluoride (NaF)	4 ppm by volume
Cs-137	Trace

#### 4.2.16 Phase 2 Main Offgas Treatment System

It is not expected that any enhancements of the offgas treatment system will be required between the end of Phase 1 and the beginning of Phase 2. However, if the Phase 1 offgas treatment system performance does not meet expectations, modifications to the system will be made. The packed tower scrubber may be used to allow the option of routing of exhaust gases either through

the SCR(s) or the tower scrubber to determine the effect on both scrubbing efficiency and scrubber blowdown rates.

#### 4.2.17 Control and Data Acquisition System

The DBVS control system and the associated data acquisition systems will be located in a trailer as shown in Figure 2-2. Some operating parameters may be monitored and operating steps may be performed manually as opposed to remotely. Personnel safety and ALARA considerations will require that many of the operations directly related to the process (mixer-dryer, melt station) be monitored and performed remotely. Other operations such as operation of the utilities, secondary waste, SCR, etc, will have key parameters monitored remotely while other monitoring and operating steps are manual. Both RD&D experiment data (process operating conditions) and offgas emissions data will be acquired.

### 4.3 SECONDARY WASTE STREAMS

#### 4.3.1 General

All Test and Demonstration Facility secondary waste streams (i.e., any output stream other than the treated DBVS waste) will be managed in accordance with the *Hanford Site Liquid Waste Acceptance Criteria* (HNF-3172) or *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063) and the receiving TSD unit waste acceptance criteria for the treatment and/or disposal path for each stream. A waste minimization program for secondary wastes will be implemented. Shipments of waste to offsite treatment or disposal facilities are not anticipated. However, should they occur, these shipments will be conducted in compliance with WAC 173-303-280(1).

Nonradioactive nonhazardous waste streams include air pollution control equipment dusts from process additive transfer, used baghouse filters, empty process additive containers, and damaged/failed equipment. These waste materials will be managed as general solid waste per *Hanford Environmental Protection Requirements* (HNF-RD-15332).

#### 4.3.2 Liquid Effluent Secondary Waste Streams

The Test and Demonstration Facility will produce the liquid secondary wastes noted in Table 4-5. The secondary waste stream will be sampled and analyzed prior to being routed to the ETF or other facility for treatment. Sampling and analysis will be performed in accordance with the waste acceptance criteria of the receiving disposal facility. Secondary wastes will be collected either continuously or at scheduled intervals and stored at the Test and Demonstration Facility in 68,140-L (18,000-gal) double-wall tanks. Up to 10 liquid effluent storage tanks may be onsite at the Test and Demonstration Facility at a given time, depending on the rate of waste generation and the duration of sampling and analysis. Sampling and analysis procedures are noted in Section 6.0. When a tank is filled, its contents will be sampled and the waste will be transported to the ETF. If required, wastes will be filtered prior to shipment to ETF. If the waste does not meet ETF waste acceptance criteria, it will be sent to a DST or other approved Hanford Site storage facilities.

Tank construction will meet the requirements of WAC 173-303-640 and will be equipped with freeze protection consistent with Performance Category-2 (ambient temperature of 34°C [30°F]).

**Table 4-5. Liquid Secondary Wastes**

Waste	Source	Frequency of Generation	Pollutants
Washdown Water	Equipment Cleaning, Spill Remediation	Recurring (Equipment Cleaning) Infrequent (Spill Remediation)	Particulate Matter, Radionuclides, Caustic (high pH) Solution
Boiler Blowdown	Boiler Maintenance	Infrequent	Particulate Matter, Boiler Antifouling Agents, Surfactants
Mixer/Dryer Condenser, Mist Eliminator Drainage	Mixer/Dryer Offgas Condenser, Mist Eliminator Operation	Recurring (Scheduled Holding Tank Discharge)	Particulate Matter, Radionuclides
Scrubber System Blowdown or Bleed	Main Offgas Treatment System Operation	Recurring (Scheduled Scrubber Holding Tank Blowdown) Continuous (Scrubber Holding Tank Bleed)	Particulate Matter, Radionuclides, Caustic (high pH) Solution, Dissolved Inorganic Gases, Dissolved Acid Gases, Organic Compounds

### 4.3.3 Solid/Semisolid Secondary Waste Streams

The Test and Demonstration Facility will produce the solid, semisolid, or sludge secondary wastes noted in Table 4-6. Unless otherwise stated, these wastes will be collected on a scheduled basis and disposed in permitted facilities. Wastes that will routinely be returned to process use, such as spilled nonhazardous process additives, are not included in this list.

**Table 4-6. Solid/Semisolid Secondary Wastes**

Waste	Source	Frequency of Generation	Pollutants
Spent Carbon Filters	Main Offgas Treatment System	Scheduled or Upon Detection of Pollutant Breakthrough	Particulate Matter, Radionuclides, Organic Compounds
Spent HEPA Filters	Mixer/Dryer Offgas Treatment System, Main Offgas Treatment System, ICV® Purge Air Inlet	Scheduled	Particulate Matter, Radionuclides, Organic Compounds
Spent SCR Catalyst	Main Offgas Treatment System	Scheduled or Upon Detection of Catalyst Fouling/Poisoning	Particulate Matter, Radionuclides, Organic Compounds
Scrubber Tank Sludge	Main Offgas Treatment System	Scheduled or Upon Detection of Excessive Buildup	Inorganic Solids, Water Containing High or Low pH Inorganic Compounds, Radionuclides, Caustic (high pH) Solution, Organic Compounds
Used Personal Protective Equipment	Equipment Cleanup, Maintenance, and Operation	Recurring	Particulate Matter, Radionuclides
Failed/Damaged Equipment	Equipment Cleanup, Maintenance, and Operation	Recurring	Particulate Matter, Radionuclides

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## **Section 5.0**

# **Operations Plan**

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## 5.0 OPERATIONS PLAN

Operation of the DBVS during the RD&D project will be conducted in two phases. During the first phase, up to three container loads of waste will be processed. During the second phase, approximately 47 to 49 container loads will be processed. The total number of containers processed for both phases is expected to be approximately 50. This section presents the general operating plan for both phases.

A campaign is defined as the receipt, processing, and vitrification of waste in a single container. A campaign may contain more than one vitrification cycle (i.e., a half-full container is vitrified under a set of parameters and another vitrification cycle is conducted in the remaining half of the container after cool-down to determine the effect on glass characteristics of multiple vitrification cycles). Another potential cause of a less than full container would be problems with the mixer/dryer or other equipment while the melt is in process. In this case, once the equipment problems were resolved, the melt could be resumed and the box filled to normal levels with waste. Each campaign will be conducted in accordance with a test plan.

### 5.1 OPERATIONS OVERVIEW

#### 5.1.1 General

This section describes the parameters under which a campaign will be conducted. The previous testing programs (AMEC 2003) were performed at various scales using simulants to develop baseline operating envelopes for treatment of waste materials and to more closely define the range of acceptable system performance. It is anticipated that the processing conditions developed as a result of the RD&D project will be used as baseline conditions for full-scale system design and operation.

#### 5.1.2 Operating Parameters

During each campaign, waste material will be treated under a fixed set or range of process conditions to determine the optimum set of vitrification parameters that will produce acceptable treated waste while protecting human health and the environment. Three types of test parameters have been identified:

- Waste characteristics – Characteristics of the waste material that are likely to be encountered during DBVS waste treatment and that may influence processing results.
- Process parameters – Process settings or methods that can be adjusted to optimize quality of the treated waste or to investigate specific aspects of process performance.
- Process additives – Variations in the composition or characteristics of process additives and their effect on the vitrification process.

Figure 5-1 is a graphical representation of the types of parameters and their overall relationships. The dark portion of the diagram represents the zone where test points will initially be selected. The values selected for each parameter type will be those that will produce acceptable treated waste. It is possible that the optimum processing conditions will fall outside the initial range of parameter values selected.

Boundary ("operating envelope") values for optimized operating parameters will be determined in the initial portion of Phase 2 and additional campaigns will be conducted within that phase until optimized conditions have been determined.

The initial test parameter values (or settings) will be selected prior to conducting a campaign based on engineering-scale test results and anticipated full-scale operating scenarios. As the RD&D project progresses, the results of previously conducted campaigns will be used to select new values and to establish process envelopes and control parameters. A draft test matrix and objectives are included in Appendix A. The final test matrix will be developed jointly between Ecology, ORP, and CH2M HILL. This matrix will be developed to support supplemental waste treatment technology decisions required by the HFFACO (specifically, Milestones M-62-08 and M-62-11) and to support waste form qualification. At this time, the range of parameter values and their relationships have not been finalized.

Changes to process conditions during a campaign producing a specific treated waste will only be made to keep the process equipment running consistently. Adjustment of these parameters will be controlled in such a way that significant changes will not result in system upsets or result in conditions that cannot be reproduced in full-scale processing.

Accurate determination of the effect of a given parameter change is critical to the testing project in terms of system design, process optimization, and expansion of the potential system operating envelope. Therefore, only a single parameter will be changed at a time within a campaign unless the relationship between multiple parameters requires that more than one variable be changed (e.g., treating material with high moisture content may require adjustment not only to feed additives but also to the treatment rate).

## 5.2 TEST PLAN

Conducting a campaign requires documentation of activities and procedures to be performed, therefore, a test plan will be prepared for each campaign. Test plans will include the following:

- Objective(s) of campaign
- Timing, duration, and schedule of campaign
- Description of feed materials and additives
- Pre-test preparations
- Baseline process parameters
- Range of parameter adjustments
- Operating procedures
- Management of treated waste
- Type, quantity, and sequence of data acquisition
- Reporting requirements
- Health and safety/contingency planning.

1 Testing of the bulk vitrification technology will incorporate a series of process variables that can  
2 be varied over a predetermined range; with the goal of optimizing both treated waste quality and  
3 process operations. In addition to the various technology-specific parameters, the characteristics  
4 of the waste material and glass formers are also varied during the testing project. A range of  
5 physical, chemical, and radioactive properties may be expected in the actual waste feed material.  
6 The test plan will accommodate the expected range of these characteristics by including them as  
7 testing variables.

### 8 **5.3 OPERATOR PREPARATION**

9 All RD&D activities will be conducted in compliance with applicable site activity constraints,  
10 health and safety considerations, and site-wide policies. A complete understanding of the scope  
11 and procedures involved in a campaign will be provided to all operating personnel before  
12 treatment of materials is begun. CH2M HILL and the DBVS vendor have the responsibility for  
13 providing this understanding through a formal classroom and field training program. The test  
14 plan provides the basis for this preparation, which has two major components: equipment  
15 operation and site operating constraints. The process operations portion of the preparation will  
16 be both technology-specific and project goal-specific.

### 17 **5.4 DATA ACQUISITION**

18 Collection of accurate and relevant data during a campaign is necessary to determine that  
19 satisfactory material processing and treated waste generation has occurred. The subsequent  
20 correlation of this data will determine the suitability of a given set of operating conditions. Data  
21 acquisition frequency will vary, depending on the relationship between the parameter altered and  
22 the data type. The sampling type and frequency are presented in Section 6.0, Waste Analysis  
23 Plan.

24 Data acquisition requirements must assure that all personnel are aware of the level of observation  
25 and data acquisition accuracy expected during the campaign. Data acquired will be used for  
26 assessing system performance, treatment results, waste form performance, and LDR compliance.

### 27 **5.5 CAMPAIGN DURATION**

28 Actual duration may vary greatly based on the amount of material placed in the waste container  
29 and the vitrification process parameters. A detailed determination of the total number of  
30 campaigns to be conducted, and the duration of those sessions cannot be made at this time. The  
31 anticipated number of campaigns is approximately 50 conducted over 365 operating days, which  
32 may require more than one calendar year to complete (OSWER Guidance Manual).

### 33 **5.6 SYSTEM OPTIMIZATION**

34 Given the steady-state nature of the DBVS process and the batch size(s) of treated waste  
35 produced during a single campaign, it is not likely that significant process adjustments will need  
36 to be made during the course of a campaign. Instead, the system will be controlled to match the  
37 stated test parameter values for the campaign as closely as possible.

Therefore, process optimization for this technology for each campaign will be limited to step changes in material composition, process settings, and operational changes made once testing using the initial set of test parameters (Section 5.1.2) has been completed. Changes made between campaigns during the initial portion of Phase 2 will be based, where applicable, on the testing results from the preceding campaign(s), operating data, operator observations, a predetermined amount of change to one or more parameters, and/or other criteria described in the test plan.

Those test conditions and parameter values that indicate a trend toward optimization will be used as baseline conditions for additional campaigns with the goal of defining one or more acceptable operating scenarios during Phase 2. In this context, "acceptable" means a cost-effective reproducible set of operating conditions that results in treated waste that meets the waste acceptance criteria of the IDF or other permitted Hanford Site disposal facility.

In addition, data will be collected on the performance of the main offgas system for both phases to optimize the production system configuration and to minimize emissions of both gaseous pollutants and radionuclides.

## **5.7 NORMAL OPERATIONS**

Normal operations include waste feed and process additive preparation, feed staging, startup, process operations, and system shutdown. These are the routine conditions for the processing equipment and address basic system performance and operational, quality assurance, safety, and data acquisition activities.

The sequence and conduct of these activities will be noted in the test plan prepared for each campaign and will serve as the baseline conditions for conducting testing under the RD&D project. The system manufacturers' operations and maintenance documentation will serve as the primary guidance for operating the system, while the individual test plan for a given campaign and the Waste Analysis Plan (Section 6.0) will serve as the guidance documents for production and analysis of treated waste products.

## **5.8 UPSET CONDITIONS**

Upset conditions consist of deviations from normal conditions that can occur, even though operational impairment may not occur. An example of an upset condition is loss of vacuum in the mixer/dryer. Upset conditions can occur due to equipment malfunction, loss of process control, or inability of the processing system to maintain steady-state operating conditions. The control system will contain monitoring sensors, control logic, and alarm points consistent with the types and ranges of upset conditions that may occur. The duties of operating personnel include visual observation of process equipment and parameters in order to detect and, if feasible, correct trends in conditions that may precede annunciation of an upset condition by the control system.

Recovery from upset conditions will be initially attempted by adjustment of process conditions using either manual or automatic changes in control system settings. If this effort is not

successful, a normal shutdown of the process system will be conducted followed by performance of system adjustment and/or maintenance.

## 5.9 EMERGENCY CONDITIONS

Emergency conditions are postulated from safety analyses and are discussed in more detail in the Contingency Plan (Section 10.0 and Appendix C). Examples of emergency conditions would be loss of system electrical power, failure of a critical mechanical or powered component, or unstable process conditions. The intent of the safety analyses is to identify these low-probability accidents during conceptual and preliminary design. Plant conditions resulting from such conditions will preclude further operation until repairs or adjustments are made. System and structural designs will address design-based accidents. Recovery from any such incidents will require specific plans to return the plant to normal operational conditions. Appendix E contains operational parameters, measurement methods, limit values, and response actions.

## 5.10 EMISSION SAMPLING

CEMS calibration, testing, and operation will be conducted in compliance with EPA Regulation 40 CFR 60, Appendix B, applicable WAC test methods, and the *New Source Review Notification of Construction for the Supplemental Treatment Test and Demonstration Facility* (Schepens 2004). Stack testing will be conducted in compliance with EPA regulation 40 CFR 60, Appendix A, applicable sections of SW-846, and applicable WAC test methods.

## 5.11 REPORTING

At the completion of the campaign and subsequent data analysis, a summary report will be prepared addressing the conduct of the campaign, operational data acquired, and emissions and treated waste analysis results. It is anticipated that the testing results can be applicable to additional campaign(s) and/or the transition to full-scale operation of a bulk vitrification facility. Potentially applicable aspects of system design, operation, and data acquisition will be discussed in the report and presented along with recommendations for implementation. Test reports will be made available for Ecology review and use at the Test and Demonstration Facility.

At the completion of Phase 1, a report on test conduct, findings, and conclusions will be prepared. The various campaign reports will be incorporated into a comprehensive report for Phases 1 and 2 (Section 9.0) to be submitted at the completion of the RD&D project or on date(s) noted in the RD&D Permit.

## 5.12 EQUIPMENT OPERATING CONSIDERATIONS

Safe and consistent equipment operation is essential to achieving the RD&D project objectives. Accordingly, prior to final treatment equipment design and installation for the DBVS, conditions that may result in unscheduled equipment shutdowns, out-of-bounds process operation, or incomplete/ineffective waste treatment will be identified. Equipment and control system designs will ensure that safe shutdown and recovery can be conducted should upset or emergency conditions occur.

Figure 5-1. Test Parameter Relationships

